

The Journal

OF THE

Ministry of Agriculture

DECEMBER, 1921.

PRINCIPAL CONTENTS.

(For Complete List of Contents see page xv.)

	PAGE
The Work of the Rothamsted Experimental Station, 1918-1920. <i>E. J. Russell, D.Sc., F.R.S.</i> - - -	777
Imperial Fruit Show - - - - -	787
Egg-Laying Trials. <i>J. W. Hurst</i> - - - - -	794
Agriculture Behind the Lines in France. <i>Lieut.-Colonel J. H. Forrester Addie, C.B.E., and Captain A. T. A. Dobson</i> - -	801
The Cost of Horse Labour. <i>Arthur G. Ruston, B.A., B.Sc., D.Sc.</i>	810
Seed Control, 1920-21 - - - - -	816
Prune-Growing in South-West Bedfordshire. <i>N. J. Wood</i> -	823
Storage of Apples - - - - -	825
Progress in the Redemption of Tithe Rentcharge -	827
Notes on Manures for December. <i>E. J. Russell, D.Sc., F.R.S.</i> -	830
Notes on Feeding Stuffs for December. <i>E. T. Halnan, M.A., Dip. Agric. (Cantab.)</i> - - - - -	833
Conciliation Committees in Agriculture - - - - -	836



LONDON:

PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE,
AND PUBLISHED BY THE MINISTRY OF AGRICULTURE AND FISHERIES.

(To be obtained from the Ministry's Offices, 10, Whitehall Place, London, S.W.1.)

EDITORIAL AND
PUBLISHING OFFICES:
10, WHITEHALL PLACE,
LONDON, S.W.1.

MONTHLY.
[PRICE SIXPENCE.]
Post free.

AGENTS FOR ADVERTISEMENTS:
C. VERNON & SONS, Ltd.,
38, Holborn Viaduct, E.C.1;
58/62, South Castle Street, Liverpool.

AGRICULTURAL LIME

To All Cultivators of Land:

USE OUR GENUINE GROUND LIME

GROUND LIME is a **FERTILISER**, and secures
HEAVIER CROPS with a **MINIMUM** of **EXPENSE**

GROUND LIME, if applied to the land in quantities of about 10 cwt. or more per acre per annum, will produce greatly augmented **CROPS**, whether of Cereals, Clovers, or Leguminous Plants.

THIS LIME is a **SOIL FOOD**, an **INSECTICIDE**, a **FUNGICIDE**,
and the **BEST REMEDY** for "**FINGER-AND-TOE**" **DISEASE** in
TURNIPS, &c.

For Prices of

AGRICULTURAL LIME

AND

**GROUND
CARBONATE OF LIME**

Write to—

**THE CEMENT MARKETING COMPANY, LIMITED,
LIME DEPARTMENT,
8, LLOYDS AVENUE, LONDON, E.C.3.**

Telegraphic Address:—"**PORTLAND, FEN, LONDON.**"

*Telephone No:—***5690 AVENUE (Private Exchange).**



We've got no
work to do.

**Certain Destruction
to**

Rats and Mice

by the well known preparations

**DANYSZ VIRUS,
MALLER'S EXTRACT of SQUILL,
DANZO RAT KILLER.**

Write for particulars to the Proprietors,

MALLER LABORATORIES LIMITED

(formerly Danysz Virus Limited),

325, Borough High Street, London, S.E.1.

**NOW is the TIME to
MANURE your GRASSLAND.**

POTASH

Autumn or Winter
manuring is the
best for Hay

14 %

FRENCH KAINIT

One of the most effective
manures ever used on Grass-
land.

Use SYLVINITE

20 %

It is the cheapest per Unit.

For Supplies and Quotations apply to
your Manure Merchant.

Free copies of publications from

The Alsace-Lorraine Development & Trading Co., Ltd.

Pinners Hall, Old Broad St., London, E.C.2.

POTASH MANURE SALTS	20 %
	30 %
MURIATE OF POTASH	50 % (K ₂ O)
	60 % "
SULPHATE OF POTASH	90 % Purity
	96 % "

PILCHERS STOPROT

The Finest Wood Preservative for all Purposes



Treating Sections of Army Huts with PILCHERS STOPROT.

(Contractors, W. PATTINSON & SONS, Ltd., Ruskington, near Sleaford).

PILCHERS, Ltd., MORGAN'S LANE, LONDON, S.E.

HIGH GRADE BESSEMER Basic Slag

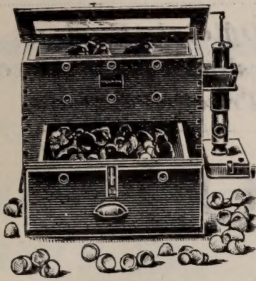
38%
Phosphates of Lime

42%
Phosphates of Lime

**ENGLISH
MAKE**

Manufactured by

The **LEEDS PHOSPHATE WORKS LTD**
LEEDS -----Yorks



The Nonpareil Incubator.

Fitted with Patent Copper Tank, Patent Insulated Capsule Regulator.

THE PROVED CHAMPION INCUBATOR OF THE WORLD.

PRICES:
30 Eggs .. £8 5 0 | 100 Eggs £10 18 6
60 " .. 9 7 6 | 200 " .. 21 5 6
If with our Patent Self-Supply Lamp, which requires no attention the whole time of hatching, price extra.

POULTRY HOUSES A SPECIALITY.

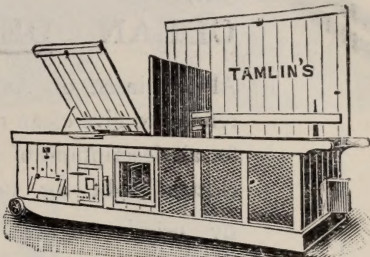
Over 50 different sizes and designs to choose from. They are made from the best yellow (not white) tongued, grooved and V-jointed matching on stout yellow framing. *Catalogue, post free.*

**W. TAMLIN, 8, St. Margarets Works,
TWICKENHAM.**

TAMLIN'S
Incubators and
Poultry Houses

FOSTER-MOTHER.
"NONPAREIL."

**OVER 50
GOLD AND
SILVER
MEDALS
AWARDED**



**THE ONLY REARER IN THE WORLD
AWARDED GOLD MEDAL.**

60-Chick size, 7ft. long, 2ft. 6in. high, 2ft. wide,
Fitted with Best Copper Tanks, absolutely
Stormproof. **PRICES, packed:**

60-Chick size..	..	..	..	£10	5	0
100 " " " "	..	..	..	11	15	0

**Better Methods
mean
Increased Profits**

USE
CONCRETE
ON THE FARM

THERE IS MONEY IN IT

Illustrated Pamphlets describing the numerous ways in which this material may be employed on the Estate and Farm may be obtained, post free, on application to the

Concrete Utilities Bureau,
Dept. 1 B,
35, Great St. Helens, London, E.C.3.

ANGLO'S VAPORISING OIL

*The Official Fuel at the
Shrewsbury and Lincoln
Tractor Trials.*

For
CLEAN DEPENDABLE POWER

Always insist on Anglo's Vaporising Oil, which is highly refined to give clean running, reliable and consistent power for all descriptions of Farm and Dairy work or for generating electric light for business or household requirements.

By using Anglo's Vaporising Oil you are assured maximum power and dependability, together with cleanest running at lowest cost.

ANGLO-AMERICAN OIL CO., Ltd.

Head Office—

36, Queen Anne's Gate, London, S.W.1.

Branches and Depots Everywhere.



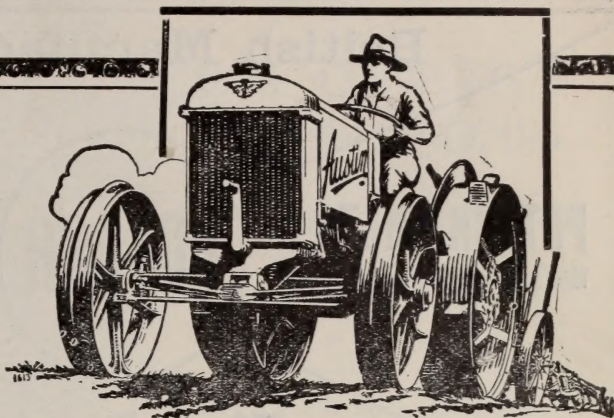
An Ideal Food for Fowls, Ducks, Turkeys, etc.

Sole Manufacturers:

HARRISON, BARBER & Company, Limited,
186, York Road, King's Cross, London, N.7.

Telephone No.—NORTH 2886.

**THE TRACTOR
THAT IS
NEVER IDLE.**



The
AUSTIN



**Lightweight
TRACTOR**

finishes one job quickly, and
as quickly starts another.
It is adaptable for every
form of power-farming, no
matter what the season or
weather, and its reliability,
soundness and small fuel
consumption earn golden
profits for the farmer who
owns it.

**EASY TO HANDLE.
RUNS ON PARAFFIN.**

Write for booklet—

**"TRACTOR
FARMING."**

**THE AUSTIN MOTOR
CO., LTD.,**

**Head Office :
Northfield, Birmingham.**

London : 479-483, Oxford St., W.1.

Manchester - - 130, Deansgate.

And at Liancourt and Brussels.

British Manufactured.

POTASH SALTS

Minimum 20% Pure Potash
 " 14% " "
 " 12% " "

POTASH

**Muriate
 of
 Potash**
 50% and 60%
 PURE POTASH.

Flue Dust

CONTAINING 18/25% SULPHATE.

SULPHATE OF POTASH.

Immediate Delivery from Stock.

For Prices and Particulars of Potash and other Fertilisers

Apply **THE BRITISH CYANIDES CO., LTD.,**

Oldbury, near Birmingham.

London Office—

49, Queen Victoria Street,
 E.C.4.

VIVIAN—Best and Cheapest Always

The charm of Poultry Keeping is
 often lost through the use of
 inferior appliances.

VIVIAN'S METHOD—

**QUALITY AND CHEAPNESS
 ENSURES SUCCESS.**

Prices from—

£2 to £50

**INCUBATORS &
 POULTRY HOUSES**

100 Egg-Size Hot Water Incubators, £7 10s.

NEW

Illustrated List

ON APPLICATION.

Manufacturer also of Garden
 Huts, Garages, Greenhouses, Summer
 Shelters, Dog Kennels, Bungalows,
 and all kinds of Portable Woodwork.

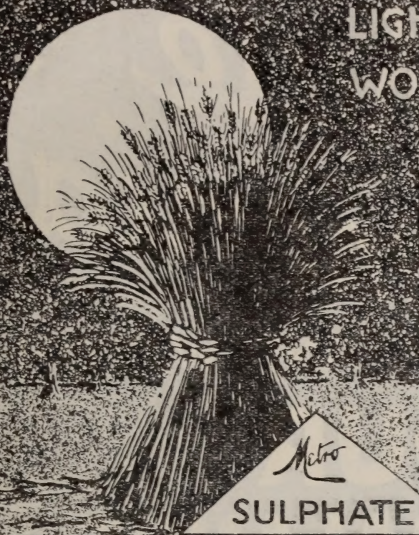
F. N. VIVIAN,

Timber Merchant and Poultry Appliance Manufacturer,
 254, North End Road, Fulham, London.

Established at this address 25 years.

SOUTH METROPOLITAN GAS COMPANY'S DRY NEUTRAL SULPHATE of AMMONIA

LIGHTENS AND BUMPER
WORK SECURES A HARVEST



It is Dry - It does not Cake
- - It is Acid-free - -
It does not absorb Atmospheric
- - Moisture - -
It can be readily Drilled into
- - the Soil - -

*It is guaranteed to contain
25½ % Ammonia.*

*For prices and all details apply to:
(Department M.A.)*

South Metropolitan Gas Company,
709, OLD KENT ROAD, LONDON, S.E.15.

An Announcement of Interest to

**PROGRESSIVE FARMERS, ESTATE
AGENTS, COLONISTS & PLANTERS,
AGRICULTURAL COLLEGES, etc.,**
regarding

DRAINAGE AND IRRIGATION SCHEMES.

A reliable Levelling Instrument is essential to success in projects of even moderate size. At the same time there is no need to engage a professional Surveyor if you have one of our

Farm Levelling Outfits.

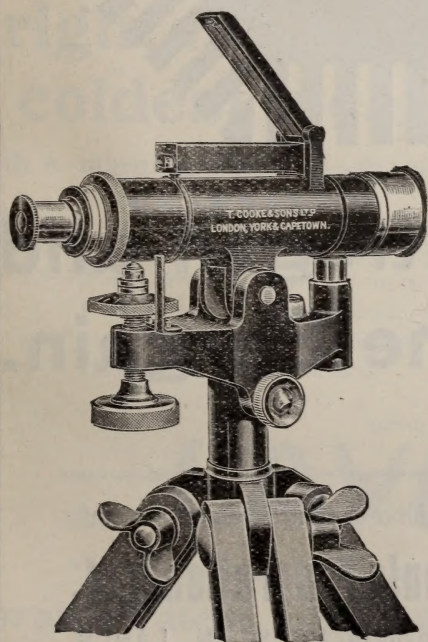
No skill required to manipulate, yet accurate in use.


PRICES—

LEVEL complete in box, with tripod, £8 10s.
Special STAFF for use with same, £2 16s.

Our Leaflet No. 504, giving full particulars, sent free on request.

T. Cooke & Sons, Ltd.,
Buckingham Works, YORK.





USE
*Sulphate
of Ammonia*
AND WATCH
**YOUR
BANK BALANCE
GROW**

**Richest in Nitrogen and
British into the Bargain.**

For interesting free information on Fertilisers and advice on all fertilising problems, write

British Sulphate of Ammonia Federation, Ltd.

Dept. M.A., (G.P.O. Box 50), Fishergate, PRESTON, LANCs.

WINTER SPRAYING AND LIMEWASHING.

The Vermorel "Eclair" Series.



"Presto." 6½ gallons.

All Types Made and Stocked.

3½ pints to 66 gallons.

No. 4. The "Presto" Sprayer & Limewasher.

A strongly made but light, single-wheeled machine with a capacity of 6½ gallons. It is narrow and can be moved about easily. It is made of a Special Brass Alloy suitable for use with almost all spraying preparations, including Lime Sulphur, and it can be fitted with LANCES FROM 2 ft. TO 15 ft. IN LENGTH.

WATCH THIS SPACE EVERY MONTH FOR A DIFFERENT TYPE OF SPRAYER.

The following **Spraying & Limewashing Machines** were described in previous issues of this Journal:—

March and Nov.	Knapsack, 3½ gallons.
April ...	Hand, 3½ pints.
May and October	Bucket, 3½ gallons.
June ...	Single-Wheeled, 6½ gallons.
July ...	Horse-drawn Automatic, 66 gallons.
August...	Dry Sprayers. Hand-Knapsack-Horse-drawn.
September ...	2-Wheeled, 22 gallons.

Full particulars and catalogues from—

COOPER, PEGLER & CO., Ltd., 24b, Christopher St., E.C.2.

Hens lay steadily right through the coldest weather

with a morning warm mash of LAYMOR

Here is the reason. LAYMOR is a specially prepared winter food for your hens, containing Spratt's Meat-Fibrine, and *proved by independent analysis to be 99 per cent. digestible.* That is to say, LAYMOR is ALL FOOD; it is not bulked up with useless fibrous matter for the sake of cheapness; instead it is a complete laying meal in concentrated form.



LAYMOR is easy and economical to use.

SPRATT'S
LAYMOR

Now only 11½d. a 3½lb. Bag, or 26/- per cwt. from your own dealer.

Spratt's Patent Ltd., 24, Fenchurch St., E.C.3.

Why build expensively?

The Cyclops way is the economical way. Its efficiency is unquestioned.

With Cyclops blocks one can build a house from cellar to roof with raw materials frequently found on the site. Cyclops blocks made on Cyclops machines have been used for the building of houses, picture palaces, libraries, garages, silos, farm buildings and many others.

They are now being used for the construction of Railway Stations in Nigeria. Whether made with semi or complete cavity blocks, the building built the Cyclops way will be cool in summer and dry in winter. The rich face down mixture concrete renders the blocks impervious to moisture and obviates the use of waterproofing compounds or rough cast work. Any man can learn how to operate Cyclops machines and to build with the blocks by using the Cyclops patented mortar gauge. This enables an even quantity of mortar to be placed on each block and ensures alignment, and enables unskilled men to build both in blocks or slabs after a week's tuition.

Porous Drain Pipes quickly drain agricultural land. Moulds for same can be made up to 4 ft. 6 in. diameter.

Fence Posts, Building Blocks, Slabs or any other form of Concrete made to order.

Send for our new 32 page catalogue.

**The Cyclops Concrete Company,
HILBRE STREET, LIVERPOOL.**

Telephone: ROYAL 1195.

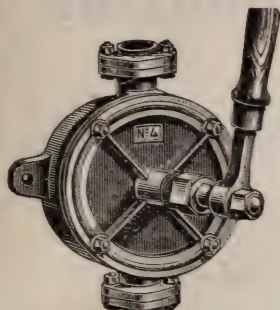
ESTAB. 1882.

Telegrams: "ASSESSOR."

—Sellers of Milk—

Sell your milk to the best advantage. UNITED DAIRIES (WHOLESALE) LIMITED are always open to entertain offers of good dairies of milk delivered London on any line of Railway, or to any of their country Creameries. Collection arranged where necessary. A plentiful supply of churns provided and returned regularly. Prompt payments. Send particulars to United Dairies (Wholesale), Ltd., 34, Palace Court, Bayswater, London, W.2.

—Buyers of Milk—



**SEMI-ROTARY WING
LIFT and FORCE PUMPS**
for Water Carts, Farm and Estate
Work, and general purposes. All
sizes $\frac{1}{2}$ in. to 3 in. connection.

Willcox's

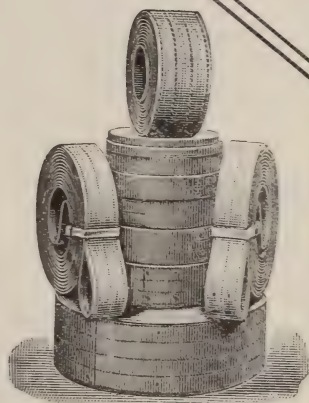


**LUBRICATING
OILS AND
GREASES.**

For all Types of
Engines and Machines.

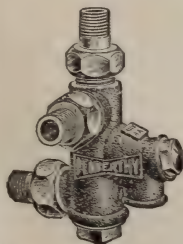


Specialities for Agricultural Engineers, Machinists, &c.



**Best English
Tanned
LEATHER
BELTING**

Hand-Sewn; also
Cotton, Hair and
'Balatite' (regis-
tered trade mark)
Balata Belting, &c.



"PENBERTHY" INJECTORS
Automatic (as illustrated), and Autoposi-
tive: For high pressures on Traction
Engines, &c.; **"MANZEL" AUTO-
MATIC OIL PUMP LUBRI-
CATORS**; **"JOINTITE"** High
Pressure Sheeting; Asbestos and India
Rubber Goods; Joints; Rings; and
Packings of every description.

LET US QUOTE FOR YOUR
REQUIREMENTS.



**PATENT
WIRE-BOUND
(non-rubber)
WATER LIFTER
HOSE**
Will not kink;
perish or
collapse.

W. H. WILLCOX & CO. Ltd.,
32-38, Southwark Street, London, S.E.1.

MAXIMUM CROP PRODUCTION

IS IMPOSSIBLE

WITHOUT JUDICIOUS POTASH APPLICATIONS.

The complete series of Potash Fertilisers are only supplied by the Potash Syndicate and are always in excellent condition for sowing and mixing.

Kainit, guaranteed minimum 12·4 % Potash (but cargoes actually testing up to 15·68 %). (Also supplying common salt and Magnesia salts of proved fertilising value).

Muriate of Potash 80-85 % Purity 51·5 % Potash
 " " " 90-95 % " 56·8 % "

Potash Manure Salt ... 20 % Potash
 " " " 30 % "

Sulphate of Potash 90 % " 48·6 % "
 " " " 96 % " 51·8 % "

Sulphate of Potash—Magnesia ... 26 %
 (Invaluable for Potatoes)

Points about Sulphate of Potash.

- (1) SULPHATE OF POTASH is usually sold with a guaranteed minimum of 48 % pure Potash.
 Therefore 1 cwt. is an average dressing for 1 acre as against 4 cwts. Kainit (12·4 % minimum).
 A saving in carriage and general handling is thus effected.
 Besides:—
- (2) SULPHATE OF POTASH can be used at sowing or planting time, early or late, without any risk of retarding germination or initial growth.
- (3) SULPHATE OF POTASH has never any bad secondary effect on the soil; on the contrary, it gives rises in the soil to Sulphate of Lime which may be actually beneficial to the crop.
- (4) SULPHATE OF POTASH is definitely the best Potash combination for Potatoes, it produces a "mealier" potato than the Muriate of Potash, with a higher starch content, and with superior cooking and keeping qualities.
- (5) SULPHATE OF POTASH is likewise the best for Tomatoes, fruit trees, and indeed, for all horticultural crops where quality of produce is important and an excess of Chlorides might prove harmful.
- (6) SULPHATE OF POTASH is dry and friable, and remains supreme for mixing with other manures, either on the farm or at the factory.

For Supplies of Potash and full Particulars, apply to:—

F. W. BERK & Co., Ltd.,

1, Fenchurch Avenue, London, E.C.3.

MINISTRY OF AGRICULTURE AND FISHERIES.

Sectional Volumes of Collected Leaflets.

Well Illustrated, Recently Revised,—in stiff paper covers.

1st Edition.

<i>Volume.</i>	<i>Title.</i>	<i>Price.</i> <i>(Post Free).</i>
No. 1.	Fungus Pests of Fruit Trees	8d.
No. 2.	Insect Pests of Fruit Trees	10d.
No. 3.	Cultivation and Diseases of Potatoes	8d.
No. 4.	Fruit : Its Cultivation, Marketing and Preservation	2s. 0d.

(In Preparation).

Order direct from the Publications Branch of the Ministry,
10, Whitehall Place, London, S.W.1.

Past Issues of the Journal and Journal Supplements.

THE Ministry desires to announce that a number of copies of past issues of this JOURNAL (from Vol. I onwards) and of JOURNAL SUPPLEMENTS are still available. Full particulars will be found on p. 855 of this number.

WRITE THIS

ON A POSTCARD,

and mail it to us to-day.

“Send me a free copy of your GUIDE TO GARDEN WISDOM AND GUARANTEED GARDEN SEEDS.”

Just write that on a postcard, and post it now. We shall be delighted to send you freely and without any sort of obligation on your part a copy of our beautifully illustrated 164-page Guide.

It ensures YOUR garden being as gay and as profitable as the one you have so often admired. Larger crops of much more delicious vegetables and lovelier flowers than you have ever had before. EVERY PACKET of Seeds, too, ordered thence MUST grow for you and please you or you will get it replaced freely. This is real protection.

Write now, addressing us personally :

TOOGOOD & SONS, LTD.,

Seedsmen to H.M. THE KING, and Growers of “Better Crops” Seeds only,

SOUTHAMPTON.

CHAS.

PAGE

& CO., LTD.,

47-51, King William St.,

LONDON, E.C.4.

TELEGRAMS :

Inland: “Paganini, Cannon,
London.”

Foreign: “Paganini, London.”

N H₃

P₂ O₅

K₂ O

TELEPHONE :

Avenue 1729

(3 lines).

CONTENTS.

NOTES FOR THE MONTH—

PAGE

<i>Breeding for Milk—Entries at New Farm Institutes—Fifth and Sixth Meetings of the Agricultural Council for England—Payment of Corn Claims—Agricultural Index Number—The Destruction of Injurious Weeds—Value of the Poultry Industry—Olympia Agricultural Company's Research Department</i>	769
THE WORK OF THE ROTHAMSTED EXPERIMENTAL STATION, 1918-1920. <i>E. J. Russell, D.Sc., F.R.S.</i>	777
IMPERIAL FRUIT SHOW	787
EGG LAYING TRIALS. <i>J. W. Hurst</i>	794
AGRICULTURE BEHIND THE LINES IN FRANCE. <i>Lieut.-Colonel J. H. Forrester Addie, C.B.E., and Captain A. T. A. Dobson</i>	801
THE COST OF HORSE LABOUR. <i>Arthur G. Ruston, B.A., B.Sc., D.Sc.</i>	810
SEED CONTROL, 1920-1921	816
A UNIQUE COW CLUB	822
PRUNE-GROWING IN SOUTH-WEST BEDFORDSHIRE. <i>N. J. Wood</i>	823
STORAGE OF APPLES	825
PROGRESS IN THE REDEMPTION OF TITHE RENTCHARGE	827
NOTES ON MANURES FOR DECEMBER. <i>E. J. Russell, D.Sc., F.R.S.</i>	830
NOTES ON FEEDING STUFFS FOR DECEMBER. <i>E. T. Halnan, M.A., Dip. Agric. (Cantab.)</i>	834
CONCILIATION COMMITTEES IN AGRICULTURE	836
Land Draining as a Means of Alleviating Unemployment	839
Horticultural Advisory Council	840
Potato Growing: Demonstration Plots in 1922	841
Superphosphate: Plentiful Supplies Available	842
Marketing of Poultry and Eggs	843
Egg and Chick Distribution Scheme	845
Artificial Light and Winter Egg Production	846
Grants in Aid of Research and Advisory Work	847
Testing Agricultural Machinery	848
New Orders Dealing with Wart Disease	848
AGRICULTURE ABROAD:	
<i>Rabbit Breeding in Belgium—Seed Improvement in Canada</i>	850
Agricultural Returns, 1921	853
Past Issues of the <i>Journal</i> and <i>Journal Supplements</i>	855
Storage of Potatoes	855
Disease in Geese from Poland	855
Seeds Act, 1920	855
International Year Book of Agricultural Legislation, 1920	856
London Thoroughbred Stallion Show for 1922	856
Agricultural Research Scholarships and Fellowships	856
Leaflets issued by the Ministry	857
Questions in Parliament	858
Notices of Books	860
Library Additions	862

Any of the Articles in this Journal may be reproduced in any registered newspaper or public periodical without special permission, provided that the source is acknowledged in each case.

The Ministry does not accept responsibility for the views expressed and the statements made by contributors, nor for any statements made in the advertisement columns of this Journal.

BY ROYAL  WARRANT.

FISON'S

(IPSWICH)

FERTILIZERS

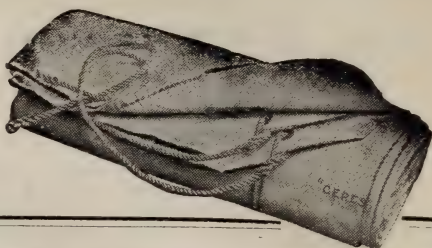
FOR ALL CROPS.

HIGH ANALYSIS. PERFECT CONDITION.

BASIC SLAG	KAINIT
FISH GUANO	BONE FLOUR
SULPHATE OF AMMONIA	
BONE SIFTINGS	BONE MEAL

LOWEST PRICES. PROMPT DELIVERY.

JOSEPH FISON & Co., Ltd,
IPSWICH.



" CERES " COVERS.

ROTPROOF AND WATERPROOF

Because "Ceres" Covers **are** Waterproof in addition to being Rotproof, they ensure reliable protection, and on account of their durability they are the most economical.

MADE FOR

**WAGONS, TRACTORS,
MACHINES, etc.**

Wagon Covers		From
Size 15ft. x 8ft.	...	£2 13 6
„ 15ft. x 9ft.	...	£3 0 0
„ 16ft. x 10ft.	...	£3 11 0

Five per cent. Discount. CARRIAGE PAID.

SUPERIOR WORKMANSHIP THROUGHOUT.

Write for Samples to :

J. RANDS & JECKELL

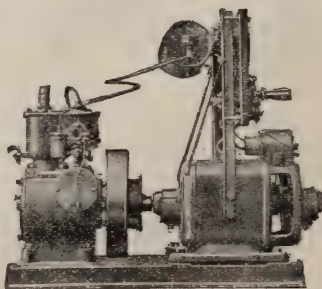
DEPT. J. **IPSWICH.**

Manufacturers to H.M. The King.

THE BRITISH  LIGHTING SET

500 CANDLE-POWER HOURS FOR A PENNY.

This is an authentic figure obtained with this reliable little plant at present-day prices. It is cheap to buy and cheap to run. It goes all day without attention and a maid can keep it in order. Give us particulars of the light or power you use and what it costs you. We will tell you candidly if you can save.



We deliver the set complete, including battery.

PETER BROTHERHOOD, Ltd.,

Branch of Agricultural and General Engineers, Ltd.,

PETERBOROUGH.

Central House, Kingsway, London, W.C.2.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XXVIII. No. 9.

DECEMBER, 1921.

NOTES FOR THE MONTH.

It is perhaps late in the day to press upon the attention of dairy farmers in this country the many advantages which may be derived from systematic milk recording. **Breeding for Milk.** The progress already made since the Ministry initiated its recording scheme in 1914 is remarkable,* but further developments are already in sight, and in publishing the articles on milk recording in Denmark in the October and November issues of this *Journal* the Ministry desired to draw the attention of agriculturists to certain features of the Danish schemes which deserve imitation here. It is gratifying to learn that in the first instance breeders in Denmark were guided by knowledge derived from a study of the methods by which British breeds of livestock reached the pre-eminence which they admittedly occupy. In so far as breeding for milk is concerned, however, the pupils may outstrip their masters. Mr. Faber's article brings convincing evidence to show (1) that in the transmission of milking qualities to his progeny the sire plays as important a part as the dam; (2) that while both should have a milking pedigree, ancestral merit alone will not ensure the transmission of milking qualities; (3) that to secure the best results and progressive improvement pedigree should be confirmed by performance. A pedigree bull does not always get good daughters. His true merit can only be judged by a progeny test.

So convinced is the Danish Government of the value of performance as distinct from pedigree, that in making provision for the award of special prizes for bulls, it was laid down that a bull is not eligible for a Government prize unless records of the performances of his daughters can be produced.

* See the Fourth Volume of the Ministry's Register of Dairy Cows, reviewed at p. 861.

Mr. Faber adds an informing fact: "before the inauguration of milk recording societies it had already become a general practice to keep bulls for service for a number of years, and . . . to judge the bulls by an examination of their offspring." On this the natural reflection is: if this is the general practice in Denmark, is there any reason why it should not become general in the United Kingdom? Mr. Faber's paper contains abundant evidence on the capacity of certain bulls to get daughters showing a better performance than that of their dams, and thereby raise the standard of the strain or breed. On the other hand there is good evidence that, on occasion, pedigree bulls get daughters whose performance is not so good as that of their dams, and it is this fact which justifies the progeny tests. A striking confirmation of this will be found in a Bulletin* recently published by the Agricultural Experiment Station, Maine, U.S.A.

The Bulletin in question gives the result of a study of the milk records contained in the Registry of Merit of Jersey Cows published by the American Jersey Cattle Club. The object in view was to place the pedigree bulls concerned in one of two classes (a) bulls the performance of whose daughters was better than that of their dams; and (b) bulls whose daughters' performances were less than those of their dams. In order to add to the reliability of the results, only those bulls were classified for which the records of two or more daughters (and of their dams) were available. Tables containing the names and numbers of 224 pedigree bulls are published showing the performance of daughters individually, as well as the records of the dams of their daughters. This interesting and important fact emerges. About one half (105) of these bulls produced daughters which on the average gave a higher yield of milk than their dams, while the remainder (119) had the contrary effect: their daughters' performances fell short of their dams. Two examples may be given. The bull named "Hood Farm Torono" is the recorded sire of 34 daughters. In the case of all but five of these daughters, the yields were higher than those of the dams. On an average the net increase on the daughters' yield over that of the dam was 2,620 lb. On the other hand, the records for the bull "Jacoba Emanon" one of the 119 which affected their daughters' yield unfavourably, show that his nine daughters on an average produced 2,190 lb. less milk than the average of their dams.

* Studies in Milk Secretion: Bull. 281, Maine Experimental Station, 1920.

These striking results may be expressed in another way. The figures show that one-half of pedigree bulls when classified on the basis of a progeny test got daughters inferior to their dams. That is to say, it was an even chance (before the performance of his daughters was ascertained) whether any one of these bulls would justify his pedigree or his retention for stock purposes.

Similarly, when these bulls were tested by their effect on the butter fat in the milk of their daughters it was found that roughly one-half produced daughters with a higher yield of butter fat than their dams had given. Lastly, when both factors were taken into consideration, total yield and butter fat percentage, only 28 Jersey sires qualified as having produced daughters superior to their dams, in respect *both* of yield of milk and of butter fat percentage. Stated briefly, the evidence from Denmark, confirmed by evidence from America, proves conclusively that breeding for milk based on considerations of pedigree only is unsafe and should be supplemented by the progeny test. That valuable results can be obtained by following considerations of pedigree, the progress made in breeding for milk in this country is some evidence, but a point has now been reached when the test of progeny must be applied if further progress is to be made.

The Ministry already publishes annually a Register of Dairy Cows* officially certified as having yielded a prescribed quantity of milk per annum, and is now considering the desirability of instituting a Register of Dairy Bulls, in one section of which would be recorded bulls having not less than two daughters entered in the Register of Dairy Cows. The benefits of such a register would be lost unless breeders abandon the general practice of slaughtering bulls before the performance of their daughters can be ascertained. Many breeders object, for various reasons, to keeping an aged bull, but none of the objections usually advanced should be permitted to outweigh the undoubted advantages that would result from the continued breeding from bulls which, by the performances of their daughters, have shown that they are prepotent in milk qualities. This, essentially, was the method by which the great breeders of the past, Bates and others, improved the existing beef breeds of cattle. Its extension to the milking breeds offers no difficulties worth consideration.

* * * * *

* See p. 861 of this *Journal*.

WITH reference to the articles on New Farm Institutes which have appeared in this *Journal*, it is of very considerable interest to note that nine Farm Institutes which opened recently have a total accommodation for 269 students, and that 216 students have been already enrolled. Seven of the Institutes have enrolled practically all the students they can accept, and in two cases only has there been a failure to secure students approximating to the maximum number which can be accommodated.

**Entries at the
New Farm
Institutes.**

* * * * *

THE 5th meeting of the Council of Agriculture for England took place at the Middlesex Guildhall, Westminster, on 4th October, the Earl of Selborne, K.G., G.C.M.G., being in the chair. Sir Douglas Newton moved the following Resolution:—

**Meetings of the
Council of
Agriculture
for England.**

“That in view of the sudden and drastic alteration made by the Government in their agricultural policy, they are hereby respectfully requested to make provision for advances on loan, in approved cases, of working capital to farmers who have recently purchased their holdings, on somewhat similar lines to those followed in the case of small holders.”

An amendment to delete the words “who have recently purchased their holdings” was moved but not carried; and, in the course of further discussion, Sir Francis Floud, Permanent Secretary, suggested, on behalf of the Minister, the addition of the following words to the original motion:—

“and that the Agricultural Advisory Committee should be asked to appoint a Special Committee of members of this Council to consider whether a sound system of credit can be devised for submission to the Government.”

The original motion, with the words added as proposed by Sir Francis Floud, was then put to the meeting and carried.

Mr. German moved the following Resolution, which was carried unanimously:—

“That this Council draws the attention of the Ministry of Agriculture to the hardships imposed upon small farmers by ruling out fractions of an acre in the total claimed for by growers in respect of wheat and oats of the 1921 crops. Since rates and taxes have to be paid on these fractions and labour bills paid for their cultivation, the Council is of opinion that the Ministry has no justification in law or equity for ruling that the ‘acre’ in the Act of Parliament does not include parts of an acre, and that the only effect of this uncalled-for economy is to deprive these small farmers of sums to which their right has been legally recognised.”*

* A copy of the statement on this subject made by the Minister in the House of Commons on 31st October, is given on p. 859.

The Report of the Live Stock Advisory Committee on matters referred to it at the Meeting of the Council of Agriculture on 4th March last, namely, (1) proposed legislation to secure the registration of all bulls kept for service, (2) slaughter of calves, (3) compilation of voluntary register of owners of pedigree herds willing to supply useful class pedigree bulls at moderate prices, to take the place of bulls rejected for the Ministry's Bull Register, was received by the Council.

At a special meeting of the Council held on 22nd November, a Resolution on the subject of the importation of store cattle from Canada was passed by a vote of 47 to 11. The Resolution was proposed by Mr. H. German and seconded by Lord Ailwyn, and ran as follows:—

“That in view of the fact that the Royal Commission on the importation of Store Cattle :—

- (1) Declined to consider the question of Imperial policy as regards the food supply of the country in time of war ;
- (2) Admitted that the importation of Canadian stores would endanger the livelihood of crofters and small-holders in the Highlands, from which it follows that the much larger number of small farmers in the North and West of England and in Wales would also be damaged ;
- (3) Failed to deal with the question of the importation of live animals from other Dominions or from foreign countries who might claim similar privileges to those proposed to be given to Canada ; and
- (4) Stated that the possible advantages to the consumer would not amount to more than an uncertain tendency to a slightly lower level of prices.

This Council is of opinion that the existing policy with regard to the importation of livestock is in the best interests both of producers and of consumers on the following grounds :—

1. It provides for the maintenance of our home meat supplies, without the cost of a single penny to the taxpayer or the consumer.
2. It affords the greatest encouragement to the development of stock-breeding and beef-producing in this country.
3. It enables us to supplement these home supplies of fresh meat with any available supplies of fat cattle which Canada or any other country can ship for immediate slaughter.
4. It strengthens our position in the world market and enables us to buy world supplies of refrigerated meat at the cheapest possible price.

The Council, therefore, respectfully urges the Government to make an immediate pronouncement in favour of the maintenance of the present system of requiring imported cattle to be slaughtered at the port of entry.”

* * * * *

ARRANGEMENTS for paying the claims under the Corn Production Acts in respect of wheat and oats of this year's crop are

**Payment of
Corn Claims.**

now well advanced. With the exception of a small number of cases requiring special investigation, the majority of growers whose claims were received not later than the 18th July have now been notified of the amount payable to them on the 1st January, 1922, and the actual payable Orders will be issued at the end of December.

Claims made after the 18th July were accepted as an act of grace, and on the understanding that payment on the 1st January next could not be guaranteed, but every endeavour will be made to make the payments as soon as possible.

* * * * *

THE agricultural index number of the prices of agricultural produce which is calculated each month by the Ministry of

**The Monthly
Agricultural
Index Number.**

Agriculture, shows that the prices at which farm produce was marketed during October in England and Wales were on the average 87 per cent. higher than the average prices for the years 1911-13. This represents a fall of 15 points, as compared with the level of prices ruling in the previous month. In October last year the average level of these prices was no less than 190 per cent. above the average of the three years 1911-13. The following table shows the figures for each month since the beginning of 1919:—

Month.	Increase per cent. on the average of the years 1911-13.		
	1919.	1920.	1921.
January	148	213	186
February	150	205	172
March	150	199	158
April	153	199	141
May	132	169	112
June	128	164	102
July	141	174	100
August	138	177	116
September	148	181	105
October	166	191	87
November	182	197	—
December	207	194	—

Wheat, barley, and oats all declined, and the average price of oats was only 34 per cent. higher than in pre-war days. Live stock, both fat and store, also fell in value, the decline being least marked in the case of dairy cows, which were only slightly lower in price in October than in September, while the average market value of dairy cows in October was fully twice as high

as in the years 1911-13. Dairy produce showed a slight fall, the average price paid under contract to milk producers during October, the first winter month, being nearly 1d. per gallon lower than the September average, owing to the stoppage of the bonus of 3d. per gallon which was paid in some districts during the latter month. Eggs alone among the commodities commonly marketed advanced in value.

Among the commodities purchased by the farmer, milling offals, oilcakes and maize were all much cheaper in October than in September, and other feeding stuffs experienced smaller declines. Nitrate of soda and superphosphate among fertilisers showed substantial reductions in price.

* * * * *

THE Minister of Agriculture and Fisheries, in accordance with powers conferred upon him by the Corn Production Acts (Repeal) Act, 1921, has made an Order authorising County Agricultural Committees to act on his behalf in relation to the provisions of the Act requiring the destruction of certain injurious weeds. The weeds referred to in the Act are spear thistle, creeping or field thistle, curled dock, broad-leaved dock, and ragwort, and the Minister is empowered to serve upon the occupier of any land where these injurious weeds are growing, a notice requiring him to cut down or destroy them within a definite time specified in the notice, a copy of which is sent simultaneously to the landlord. Failure to comply with the requirements of the notice is punishable on summary conviction by a fine not exceeding £20 and 20s. for each day during which the default continues after conviction. Proceedings must be instituted by the Minister, who shall be entitled to execute the destruction work specified in the notice and recover the cost from the offender. As regards public roads, it is held that the authorities responsible for their maintenance shall be regarded as the occupier for the purpose of the destruction of weeds.

* * * * *

THE Minister attended the Annual Dinner of the Poultry Club on 18th October, and in his speech showed the value of the poultry industry to this country.

**Value of the
Poultry
Industry.**

In 1920 the United Kingdom imported eggs and poultry to the value of £18,759,656, exclusive of imports from Ireland. Irish exports were valued at £18,236,406 in 1919,

the bulk of which came to Great Britain. Thus the value of eggs and poultry imported into Great Britain during 1920 probably reached the figure of £36,000,000.

The value of eggs and poultry produced in the United Kingdom in 1920 is believed to have been between £50,000,000 and £60,000,000, whereas the estimated value of the wheat crop in the United Kingdom for 1920 was approximately £31,000,000.

* * * * *

THE first annual report of the Research Department of the Olympia Agricultural Company has just been issued. This
Olympia Agricultural Company's Research Department. Company, it should be explained, has been formed with the object, mainly, of conducting a purely farming business on the most advanced lines. It is the owner of 10,000 acres of farming lands distributed throughout the Kingdom. The headquarters are at Offchurch Bury, near Leamington, where the Research Station is situated. A unique feature of the enterprise, however, is the recognition of the advantages that are likely to be gained from scientific knowledge and research when applied to agriculture. The report relates to the activities of a staff of scientific men who, under the direction of Dr. Crowther, late Professor of Agricultural Chemistry at Leeds and a well-known authority on nutrition, are engaged in original research in fully-equipped laboratories in Offchurch, Bury. It must not be thought, however, that the Company's motives are merely selfish. The intention is that such good as may result from the labours of the scientific staff shall be freely available to all, and advisory services are also offered free of charge to agriculturists. In this first report, naturally, one does not expect to find more than a record of the commencement of investigations. Sufficient is stated, however, to justify confident anticipations for the future, particularly in relation to plant breeding, for the Company has been fortunate in securing the services of Capt. H. Hunter, whose success in plant breeding under the Irish Agricultural Department was noteworthy—especially in relation to barley. There has been no precedent for such enlightened enterprise since Sir John Lawes founded the world-famous laboratory at Rothamsted. If the Offchurch, Bury, station achieves even a tithe of the success of its predecessor, the agricultural community will have good cause for gratitude.

* * * * *

THE WORK OF THE ROTHAMSTED EXPERIMENTAL STATION, 1918-20.*

E. J. RUSSELL, D.Sc., F.R.S.,
Director, Rothamsted Experimental Station.

THE object of the Rothamsted Experimental Station is to obtain precise information about soils, fertilisers and the growth of crops in health and disease, and to put this knowledge into such a form that it can be used by experts, teachers and well-trained farmers. The work is carried out partly on the farm and partly in the laboratory, with the pot culture house as a convenient bridge between them. No positive recommendations would be issued to farmers on the basis of pot culture work alone, because experience has shown that results obtained in pots may differ from those in the field; but the method is of great value to the investigator in enabling him to sort out the more promising materials or possibilities with a view to trial on the larger field scale.

The Work on the Farm.—The purpose of the farm experiments is:—(1) To increase the growth of crops; (2) To increase the health or vigour of the crop; and (3) To reduce the cost of production.

Increased growth of crops can be brought about by the proper use of artificial fertilisers; but by themselves fertilisers would not suffice, and farmers at any rate are not likely to forget that other factors are equally necessary. At Rothamsted constant stress is laid on the need for:—

- (a) Good cultivation, drainage and freedom from weeds;
- (b) Ample supplies of organic matter;
- (c) Sufficient lime to ensure freedom from sourness; and
- (d) Sufficient artificial fertilisers of the right kind, given at the proper time and in the proper quantity.

Cultivation (with which is included drainage) is the most important of these for two reasons: without proper cultivation it is impossible to keep down weeds or to secure a satisfactory water supply, and unless it is well carried out all efforts to increase crop production are likely to fail. The introduction of the tractor has profoundly changed our ideas of what is possible in the way of cultivation, and we do not yet know exactly what can be done even with our present implements, while the enterprise of some of the makers is perpetually leading to new modifications in the implements

* For an account of the earlier work see this *Journal*, Vol. XXVI., pp. 497-507.

themselves, which still further extend the possibilities. Broadly speaking, the effect of the tractor has been to speed up all operations so much that work can now be done as a general rule that formerly could only rarely be attempted. Certain processes carried out at Rothamsted are described below.

Autumn Cleaning of Stubbles.—Very marked benefit has resulted from the cleaning of the stubbles which was carried out at Rothamsted in the autumn of 1919, 1920, and during the present year. Corn crops, as every farmer knows, are liable to infestation by weeds, and the stubble is apt to contain quantities of weed seed. At the same time there is often sufficient moisture in the soil at harvest time to allow the germination of weed seeds *if the surface is broken up directly the crop is cut*, but the moisture is rapidly lost if the land is left bare and unworked for a short time. So long as horses only were available it was impossible to carry out the necessary cultivation quickly enough, but with the tractor the requisite speed is obtainable and the land can be broken up. As an example, Harpenden Field of 30 acres, on the Rothamsted farm, had carried several corn crops during the War and was very weedy in 1918; the weeds, however, were much reduced by the stubble cleaning carried out with the tractor during and just after the harvest of 1919. Wheat was sown in October of that year and its stubble was cleaned in 1920; wheat again was sown in 1920 and remained to the end fairly free from weeds. The bare fallow or root crop that would have been necessary in the old days was dispensed with, and sufficient cleaning was effected in the autumn to bring the land back to a satisfactory condition. It is now hoped to be able to deal with the most serious of all the farm difficulties at Rothamsted—the Broadbalk wheat field—which has carried wheat continuously since 1843 and is distinctly foul. Messrs. Ransomes, Sims and Jeffries have lent a broadshare that can be worked by the tractor, and it is hoped that this will cope with the serious weeds on this field: it certainly made good work in breaking up the surface soil and cutting off the existing weeds.

The second great advantage of the tractor is that it allows of subsoiling. Experiments during the past four years have shown that subsoiling increases the crop of potatoes by about 10 cwt. per acre, and also benefits the following wheat crop. Experiments made elsewhere show much greater gains from subsoiling wherever a plough sole has been allowed to form—a common occurrence on the heavy lands of Essex.

Time of Sowing.—A further advantage of the tractor is that it enables cultivation to be pushed forward so rapidly in autumn as to allow winter corn crops to be sown early. There is no advantage in sowing too soon, but experiments have shown that on the Rothamsted land winter oats should go in during the first fortnight in October, and winter wheat during the second fortnight. With horse cultivation it was impossible to be right up to time, and the result was a certain proportion of poor corn crops which became badly infested with weeds.

Chalking.—It is also found that the work of the tractor on heavy land can be considerably lightened by the use of chalk.* One of the fields is divided into three parts, two of which are chalked and the third unchalked. A dynamometer was attached to the tractor as it was hauling the plough across these strips. On the unchalked land the draw-bar pull was 1,610 lb. for three furrows, and the speed per hour was 1.98 miles; as soon as the plough entered the chalked strip the draw-bar pull fell to 1,425 lb. and the speed of working increased by 1 mile in 5 hours. This reduction in draw-bar pull means a considerable reduction in fuel and in wear and tear, while the additional speed is a valuable asset.

Cultivation Implements for the Tractor.—The cultivation implements in common use were designed for the horse, and it by no means follows that they are equally suitable for the tractor, which is a very different agent. The ordinary trials are not entirely satisfactory from the farmers' point of view; they are rather artificial. In practice cultivation is carried out to facilitate crop production, and the final test of the efficiency of a machine is the help that it gives to crop growth. At Rothamsted an attempt is made to carry out the test to give the farmer this information; the work of the implements is carefully observed over the whole of the growing period of the crops. The advantage of this plan is that farmers have an opportunity of seeing the implements at work under practical farming conditions, and of judging the value of the work from the growth of the crop, which is after all the best criterion. Some of the largest and most important implement makers are co-operating and lend their implements free of charge.

Supplies of Organic Matter in the Soil.—Recent experiments emphasise the importance of having ample supplies of organic matter in the soil. Some of the older agricultural chemists tended to the view that artificial fertilisers were the chief source of fertility and that little more need be done if

* This *Journal*, August, 1921, p. 419.

sufficient amounts of these were added. It is now known that the full action of artificial manures is exerted only when the conditions are satisfactory for the growth of plants. Organic matter as supplied by farmyard manure improves the conditions for the root crops, facilitating the production of tilth and increasing the water-holding capacity of the soil. It also improves the growth of clover. At Rothamsted recently it has been shown that farmyard manure causes less variation in yield from year to year than does artificial manure; further its use involves less risk of deterioration of soil when the course of cropping is abnormal. In the Broadbalk wheat field many of the plots have received a manurial treatment deliberately deficient in one or more essential constituents; in all the continuous growth of wheat may be regarded as abnormal cropping. In consequence soil exhaustion in most plots is manifested by a progressive diminution of the yield; the actual diminution is, of course, irregular owing to the varying seasons, but from a long series, such as that furnished by the Broadbalk experiment, comparable figures may be obtained representing the mean value by which the yield, in bushels per acre, decreases in each year; these figures measure the mean annual diminution. This result is set out in Table I, where the results of continuous wheat growing are given. See also Fig. 1.

Table I.—Comparison of Farmyard with Artificial Manures
(R. A. Fisher). Broadbalk Field. Continuous Wheat.

Plot No.	Treatment.	Average yield, bush. per acre, 1852-1920.	Mean annual diminution, bush. per acre.	Percentage of relative variance ascribable to weather.
2b	Farmyard manure, 14 tons annually	34.549	.031	2.78
3 and 4	No manure	12.269	.097	6.20
5	Complete mineral manure	14.180	.090	5.84
6	As 5 + single Ammonium salts	22.581	.141	6.01
7	As 5 + double Ammonium salts	31.367	.144	5.11
8	As 5 + treble Ammonium salts	35.694	.092	4.18
10	Double Ammonium salts alone	19.504	.157	11.40
11	As 10 + superphosphate	22.046	.219	10.32
12	As 10 + Super + Sulph. Soda	28.319	.181	7.28
13	As 10 + Super + Sulph. Potash	30.209	.123	5.55
14	As 10 + Super + Sulph. Magnesia	27.765	.231	6.38
17	Minerals alone, or double ammonium salts alone in alternate years	14.510	.092	10.16
18		29.006	.114	4.55

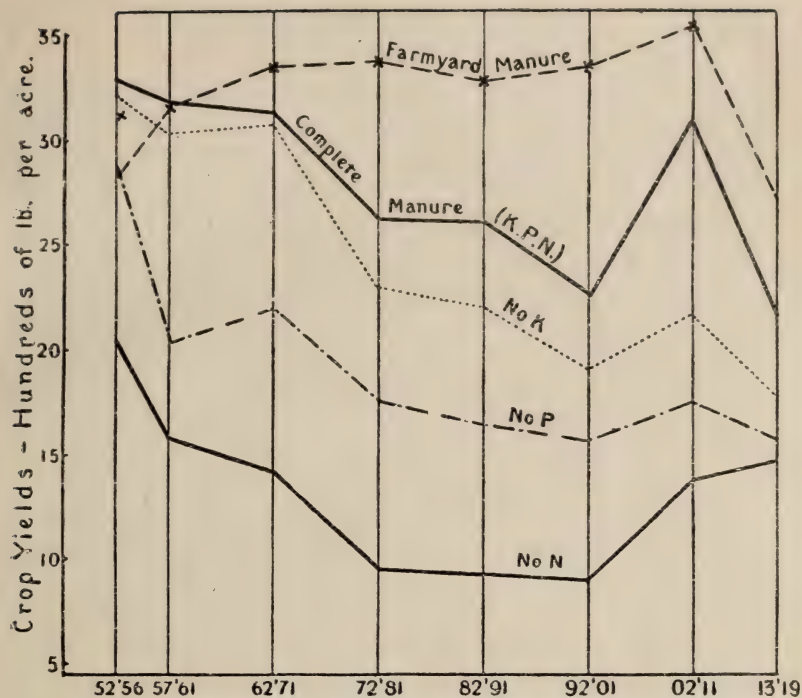


FIG. 1.—Barley yields, Hoos Field, Rothamsted, showing steadiness of Farmyard Manure effects as compared with Artificial.

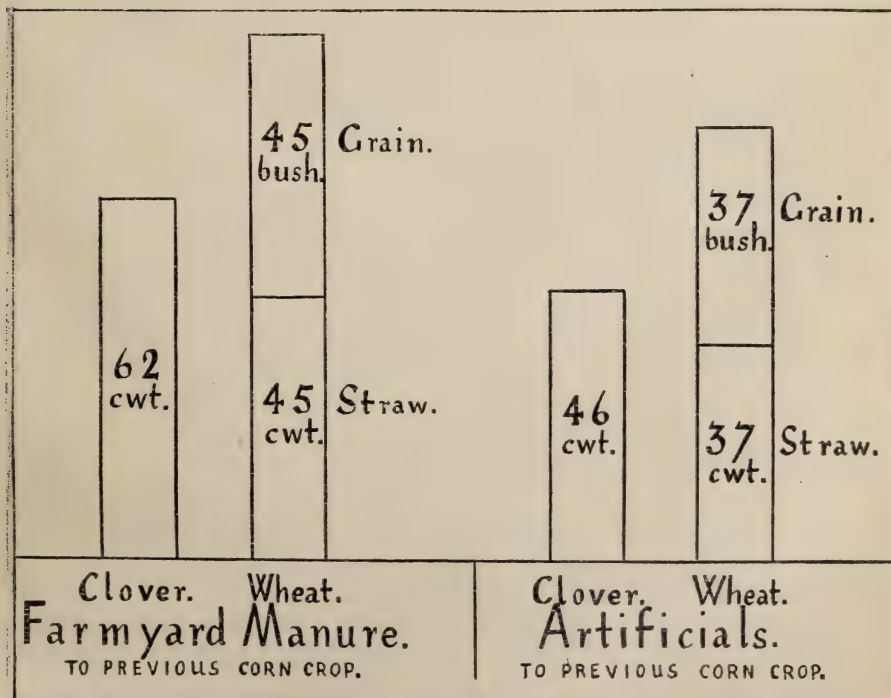
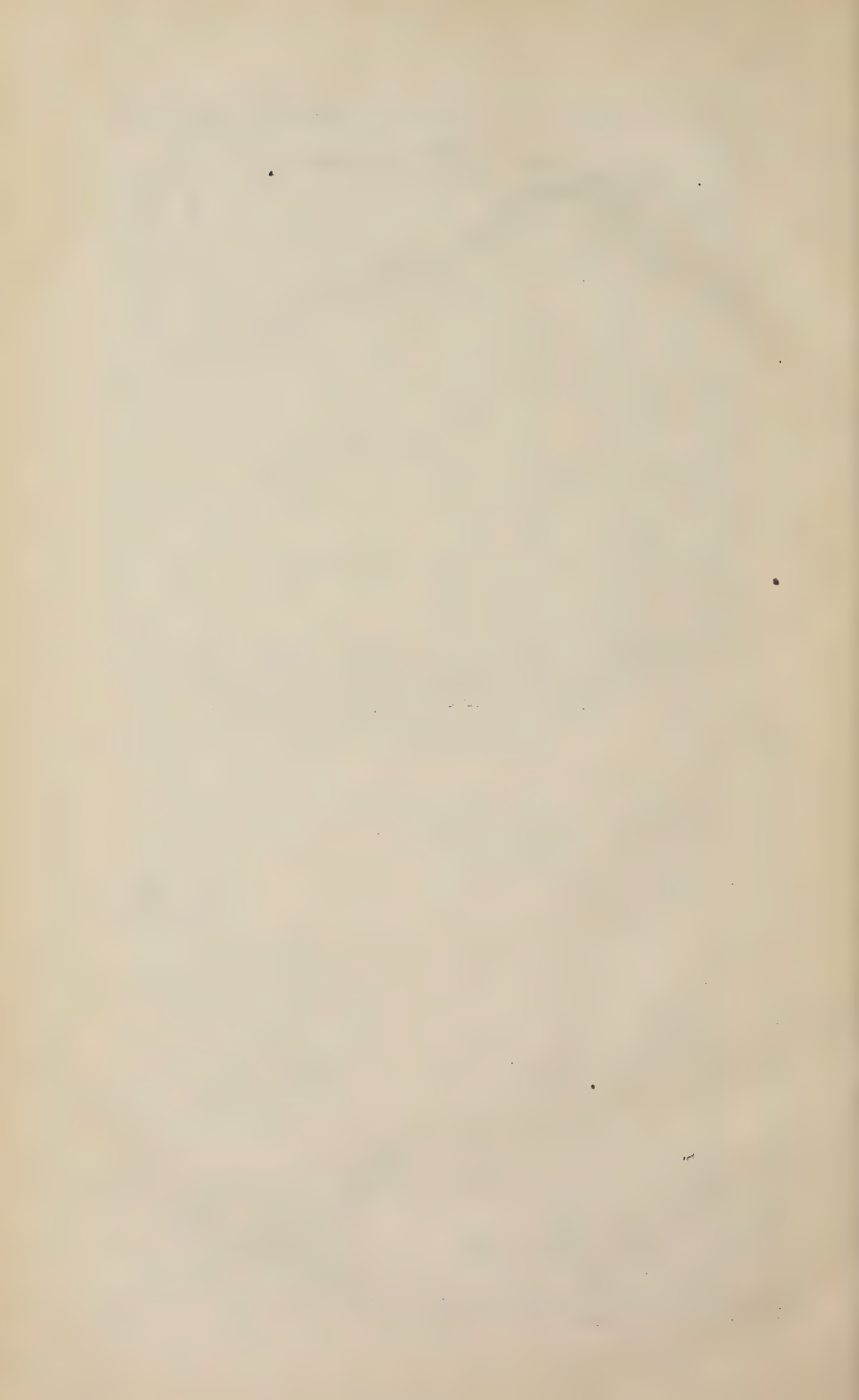


FIG. 2.—Effect of Farmyard Manure and of Artificial on Clover and succeeding Wheat Crop.



The meaning of the result is that farmyard manure is more dependable than other fertilisers, though it is not capable of giving as good yields in favourable seasons as a properly-balanced mixture of artificials.

This is not the place to discuss the scientific reasons for these various effects; a good deal of work is being done at Rothamsted and elsewhere to elucidate them, and until they are fully known it will be impossible to understand completely the best way of using farmyard manure. In the meantime there is another and far more urgent problem: how can the supply of farmyard manure or similar materials be increased?

Two general methods are being studied at Rothamsted. The first, which might be called the anti-waste method, consists in cutting down the wastage from farmyard manure, which is still unfortunately very considerable. The available quantity of manure could be much increased by better making and better storage: both making and storage can be improved by keeping the manure under cover, and by proper adjustment of litter to the amount of nitrogen in the animals' excretions.

Frequent reference has been made in this *Journal* to the necessity for better protection of the manure heap, and farmers realise the advantage of providing this. The question of adjusting the litter to the manure, however, has only recently been studied. It is found that there is a proper proportion of straw to urine, and if this is exceeded wastage results. If the straw is insufficient for the amount of nitrogen in the excretions, some of the nitrogen is lost; while if the straw is in excess, the manure will not "make" properly and the soil derives less benefit than it should. Experiments have shown that 1 ton of straw can be used for every 100 lb. of digestible protein in the animals' food. As a rule, however, the excretions are too concentrated and some added water is also necessary. When these proportions are maintained, satisfactory rotting of the straw proceeds rapidly, and the losses of nitrogen are at a minimum. Under these ideal conditions manure at Rothamsted has rotted down to half its weight without loss of nitrogen.

The second method consists in actually increasing the amount of farmyard manure or similar substances on the farm. This could be done by increasing the head of live stock on the farm, assuming the economic situation justified such a course. Farmers are thoroughly familiar with this possibility and it need not therefore be further discussed.

At Rothamsted considerable attention is being paid to the possibility of substitutes for farmyard manure. In a recent article in this *Journal** Messrs. Richards and Hutchinson described the work in the laboratories on the decomposition of straw by artificial means, whereby a substance is produced resembling farmyard manure. The results obtained with this product on the light land at Woking are quite promising, and the method is being developed. The conditions necessary for the decomposition are fortunately obtainable on the farm; they are proper air and moisture supply, suitable temperature, freedom from acidity and the addition of proper proportions of soluble nitrogen compounds.

A second method of increasing the supply of organic matter on the farm is by the use of green manuring. Attempts were made at Rothamsted to develop this method some years ago, but as the only implements then available were those worked by horses it was not found possible to sow a catch crop after the harvest, and without this, green manuring is hardly an economic possibility. With the tractor, however, greater rapidity is possible, and for the last two seasons it has been possible to sow green crops immediately after harvest and to obtain a certain amount of growth before ploughing in. The oats of 1920 grown in this way were an excellent crop.

The third possibility is to obtain manure from sewage. An extensive experiment has been carried out at Rothamsted during the last three years, showing that the new method known as the "activated sludge" treatment gives a fertiliser of high value, very considerably better than anything yet obtained. The method is effective so far as purification is concerned, and yields in addition this useful fertiliser.

The Growth of Clover.—As clover is such an important crop in arable husbandry, it has received particular attention during the past two years at Rothamsted, and the work is being extended. The significance of the crop lies in the fact that it not only yields valuable hay, but greatly enriches the soil in organic nitrogen compounds which markedly benefit the succeeding crops. It is one of the most difficult crops to grow well, and few farmers would claim that they obtain satisfactory yields as frequently as they wish. The difficulty arises from the fact that the plant depends for success on the activity of certain bacteria in its roots, and the conditions must therefore be favourable both to the plant and to the organisms.

* August, 1921, p. 398.

Experiment shows that the clover crop may be benefited by four means :—

- (1) Improvement in the method of sowing, to give the seedling a good chance of establishing itself;
- (2) Dressing of ground limestone or chalk;
- (3) Application of phosphates, and, where necessary, potash before sowing;
- (4) The use of farmyard manure.

In some of the Rothamsted experiments the weights of the young plants at the time of cutting the barley were:—

				Young clover plants. (cwt. per acre).		Barley. (cwt. per acre).
No manure	...	...	...	4.8	...	21.2
Slag and lime	...	...	...	6.7	...	31.7
Superphosphate and sulphate of potash	...	...	...	11.2	...	26.1
Farmyard manure	...	...	...	10.3	...	28.2
Superphosphate and farmyard manure	...	...	...	15.0	...	26.5

The effect of farmyard manure is so important that it is being studied in detail in the bacteriological laboratory: so far the results indicate that some of the constituents of farmyard manure have a special action on the organisms in the nodules of the clover roots. For other results see Fig. 2.

Sufficiency of Lime.—Farmers throughout the country realise the necessity for applying lime to their soil, and frequent inquiries are made at Rothamsted as to the proper amounts to use, the relative advantages of lime and limestone, etc. Laboratory methods have been devised to enable agricultural chemists to deal with inquiries of this kind, and attempts are constantly being made to improve upon them. At present chemists can advise farmers only in a general way as to the need for lime, and it rarely happens that a reliable, straightforward recommendation can be made on the basis of analysis alone.

The Proper Use of Artificial Fertilisers.—When cultivation has been properly done, sufficient farmyard manure or proper substitute applied, and adequate care exercised in the selection of suitable varieties of crops, then the farmer can hope to derive the greatest possible benefit from artificial manures. It is, however, necessary for him to know three things:—*(a)* the proper mixture to use, *(b)* the proper amount to apply per acre, and *(c)* the best time for application. Nothing short of direct field experiments gives the necessary information,

and it is by no means easy to discover the proper mixture. Years ago it was thought that the problem could be solved merely by ascertaining the ash constituents of the plants and making up a manure corresponding thereto; it is now known that no such short cut is possible. A competent chemist could prepare no fewer than 6,000 different brands of potato fertiliser, each useful under certain conditions. Field trials alone enable one to decide which of all these is the best in any given case. In practice it would be impossible to test them all; it is also unnecessary, since there are certain guiding principles which give a very fair idea of the type of fertiliser needed. Prolonged field experiments are needed to establish these principles, but in the end this is the shortest method of procedure, since without this knowledge we can do little but guess the proper mixture to use. It is not possible to make a short and simple summary of the results, but a discussion of them from the farmers' point of view is given in the writer's "Manuring for Higher Crop Production."*

The proper amount to apply can be determined only by experiment, and this has proved more difficult than was expected. It was at first thought—the idea was started by the famous German chemist Liebig—that the larger the dressing of manure the larger would be the crop; or in other words, that, up to a certain point, the crop yield was proportional to the quantity of manure added. It was subsequently found, however, that this was not the case. The next idea came much later from another German chemist, Mitscherlich; it is to the effect that fertilisers exert their greatest action when used in small quantities, and that they show less and less action as the dressing increases. This, if true, would justify low farming as being the most likely to give maximum profits. The Rothamsted experiments indicate, however, that this is not correct. The effect of small dressings is found to be less than that of larger ones; the most profitable procedure therefore is to use moderately large dressings rather than too small a quantity of artificials per acre. A bold policy is probably best.†

The question of the size of the dressing, however, is inti-

* Cambridge University Press, 1917.

† This result is at variance with one that has been obtained in the United States of America. Prof. Warren, of Ithaca, informs the writer that farmers there obtain good results, and he is inclined to think their best proportionate results, from such small manurial dressings as 4 lb. nitrogen (equivalent to 20 lb. sulphate of ammonia), and 20 lb. of phosphoric acid (170 lb. 25 per cent. superphosphate) per acre. The cause of these differences would form an interesting subject of inquiry.

mately bound up with the time of application. Many farmers are too late in their application of top dressings to cereal crops, delaying until the plant has passed the stage when it can make full use of the material supplied; it then develops a dark green growth liable to rust, and a straw that tends to lodge. The figures obtained at Rothamsted are:—

Increase in wheat crop, 1920, from spring dressings of sulphate of ammonia and superphosphate.

Date of application of manure.	Grain—bushels per acre.			Straw—cwt. per acre.		
	Feb. 10.	March 6.	May 10.	Feb. 10.	March 6.	May 10.
Single dressing ...	Nil	0·9	2·7	2·7	6·9	9·4
Double dressing ...	7·0	—	3·7	11·7	—	12·7

The single dressing gave no appreciable increase in grain and only a few cwt. of additional straw, while the double dressing gave no less than 7 bush. of grain and 12 cwt. of straw when applied at a safe and suitable time. In view of the great practical importance of this work arrangements have been made for continuing it on a larger scale.

Diseases of Plants.—No reliable estimate can be made of the losses of farm crops due to disease, but they must be considerable. It is improbable that farmers could adopt the individual treatment accorded to plants by gardeners; other methods must be sought. Some diseases are due to insects, some to fungi or various other causes. Separate laboratories are being set up at Rothamsted for the study of insects and fungi, but no detailed account of the work can be given as it is still in its early stages and has not yet developed sufficiently to justify application on the farm. In the entomological laboratory Dr. Imms is trying to ascertain what substances will attract insects. Beer and cane molasses proved very effective as baits for traps; ordinary alcohol was of little use. When, however, alcohol was mixed with a small quantity of acetic, butyric or valerianic acid it became highly attractive. Other work in this laboratory relates to the common bean aphid. This insect goes through a remarkable life history, and it spends part of its time on plants such as shepherd's purse, docks, &c., which occur on most farms in sufficient quantity for the purpose. Different varieties of beans vary in their susceptibility to attack, and the possibility of finding or

producing varieties which would be relatively immune to this pest is being investigated. In the mycological laboratory important work is being done on the killing of fungus spores and on Wart Disease of potatoes.

Work for the Future.—In the foregoing account reference has been made only to problems of immediate interest to farmers. At an Experimental Station, however, it is always necessary to look to the future and to conduct investigations which, while of no immediate practical application, show possibilities for the future.

Some of the most interesting work is in connection with the population of micro-organisms inhabiting the soil. The farm-yard manure and the green manure put into the soil are not really agents of fertility, but only raw materials out of which fertility is manufactured. The work is done by myriads of micro-organisms, some useful to the farmer, some not, many of them taking their toll of the valuable plant food in the soil. The nitrates they make are indispensable for the growth of plants, but some of them seem to take up nitrates themselves and thus compete with plants. At Rothamsted enough nitrate was produced on one plot in a single day to produce a 5-qr. crop of wheat, but it had all been removed—presumably taken up by organisms—before the end of the day so that the farm gained no advantage from the process. With fuller knowledge it may be possible to control this population and make it serve the farmer just as horses, sheep and cattle do; but we are a long way from that yet.

Finally, an attack is being made on a much more difficult problem. The growth of a crop is like the movement of a motor car; it cannot progress without a continuous supply of energy. In the case of the growing crop this energy comes from the sunlight. The plant as we grow it is not a very efficient transformer; a crop of wheat in England utilises only about *half of one per cent.* of the energy that reaches it. During the last 80 years the growth of plants has been improved, thus increasing their efficiency as utilisers of energy, but we are still far from the 35 per cent. utilisation which the motor engineer has attained. Whether such high utilisation is possible cannot be said, but it is important to try any methods that seem to offer hope of advancement. Careful tests have been made of the effect of high tension electric discharge on crop growth; of the electrical and other treatment of seeds; of the effect of radium ores; of stimulating substances such

as boric acid; and of other plans which have been proposed for improving crop growth. Some of these offer a certain amount of promise, others do not; none of them is yet in a stage to recommend to farmers. In reporting on these new ideas it is often necessary in fairness to the farmer to insist that they are not yet ripe for practical application. Yet it is always hoped that inventors will not be discouraged but will go on and try again, for it is only by steady and persistent effort in face of repeated failure that success will finally be attained, and that agriculturists can hope to make progress comparable with that of engineering and of the chemical industry.

* * * * *

IMPERIAL FRUIT SHOW.

DESCRIPTIONS have been given in articles in previous issues of this *Journal* of the manner in which the Ministry and the Horticultural Industry generally have been co-operating with the "Daily Mail," in order to secure the successful organisation of this great Show, which was held at the Crystal Palace from the 28th October to 5th November, 1921. The Show was formally opened by The Rt. Hon. Sir Arthur Griffith-Boscawen, M.P., Minister of Agriculture.

Sir Arthur Griffith-Boscawen, in opening the show, said that probably never before had there been such a show of fruit in the history of the world. He wished at the outset to recognise the energy, the generosity and the support of the Proprietors of the "Daily Mail" in enabling the Exhibition to be held. He recognised that the "Daily Mail" had performed a great Imperial service. Continuing, the Minister said: "The history of the Exhibition is this. We at the Ministry and the principal commercial fruit growers have been anxious for some time to improve and extend the cultivation of fruit in this country. For that purpose a number of local exhibitions in the principal fruit-growing districts, especially at Maidstone in Kent, Worcester in the West Midlands and Wisbech in the Eastern Counties, have been held in recent years, and those exhibitions have done a great good in bringing the growers together and letting them compete against each other, but it was thought there should be something bigger than these exhibitions, that the persons in these districts should not compete merely

against each other, but that districts should compete, and we were organising such an Exhibition when the "Daily Mail" came along and suggested something on an even bigger scale, and that was The Imperial Fruit Show. To-day we have an Exhibition not only of the British Isles but of the Empire. I wish more could be represented, but as it is our Empire exhibits are chiefly from Canada, our oldest Dominion. It would have been better if South Africa, Australia, and Tasmania could have competed, but they are in the Southern Hemisphere—their spring is our autumn—and it is impossible, therefore, to arrange such an exhibition. Here, at all events, you will see the very best of the Old Country competing on even terms with the best of the great New Country—Canada."

"The Exhibition here is a very remarkable one. Ten thousand packages of apples from the United Kingdom and Canada. Three thousand pounds worth of prizes. Exhibitions in Packing and Grading, and Cider Making Demonstrations. All these we can see here, and there is a great deal to learn."

"I am here to open this Exhibition as the responsible Minister of Agriculture. I am Minister for a great many things, including horticulture and fruit growing, which form an indispensable part of the great industry of agriculture. We realise that horticulture is a most important department of the Ministry of Agriculture. First of all it is the class of agriculture where you get the most intensive cultivation, and where you get the very best possible out of the land. It employs people possessing a great deal of skill and technical knowledge, and is therefore a very highly specialised industry. Secondly, it employs the greatest possible amount of labour on the land, and one of the most important things at the present time is the keeping of the people on the land. Thirdly, horticulture—fruit-growing—produces very necessary articles of human food. 'An apple a day keeps the doctor away,' and the more we consume the better for the health of the community. What I want to see is this: not only more apples consumed but more fruit generally. I also want to see more fruit grown here, and the fruit that we cannot grow here I want to see imported from the British Empire and not from foreign countries."

"The latest figures* give an area of about 220,000 acres under fruit. Of that area 150,000 acres grew apples. We might estimate the apple crop at about 450,000 tons, but,

* In England and Wales.

during the year ending 30th September, 1921, we imported 267,000 tons, the greater part of which was imported not from the British Empire but from foreign countries. I want to see a greater production here and a greater consumption, and I want to see imports drawn from within the British Empire. I want to see Britain and the British Empire as self-supporting as possible. Now the fact is that for many years we neglected fruit-growing in this country, but now I am glad to say we pay more attention to it."

"A good many years ago (in 1904) I was appointed chairman of a committee to inquire into the fruit industry, and we recommended at that committee a special department of the Ministry of Agriculture to deal with fruit. We now have that Department, and in Mr. W. G. Lobjoit and Mr. H. V. Taylor, the Controller and Deputy Controller, I possess two of the most efficient officers that any Ministry can have. We recommended an advisory committee. We have it, appointed by the leaders of the commercial fruit growing industry. We recommended also a committee for the scientific side of horticulture for looking into insect pests and how to overcome them. We have now the Pathological Laboratory at Harpenden, the Research Stations at Bristol, East Malling, the Lea Valley, Campden, and other places, and important work is being done at all these Stations. It was recommended that we should pay more attention to packing and grading, and there can be no doubt about it that we lose a great deal by not attending to that matter. If only our growers will pay more attention to grading and packing they will be able to supply the home markets in this country much more regularly than they do, and the public will buy more apples than they do at present."

"Another point is, that though we grow the very best apples, we grow too many varieties. We want to standardise, so that we can send up week after week large quantities of apples alike in type and character. I am not asking for legislation. I do not think legislation is required, nor do I think my advisers in the Horticulture Division would advise legislation. It is by educating the public opinion and by scientific analysis of things that the trade will learn and the light will spread. Lastly, we said there must be more facilities for obtaining land on terms fair to the owner and to the market gardener for this purpose in this country. Last year I had a share in the Agriculture Act and the adoption in it of what is called the 'Evesham Custom.'"

The Exhibition was visited by H.R.H. Prince Henry, who displayed great interest in the exhibits of apples, in the demonstrations of grading and packing, and cider making. Representatives of many other countries visited the Show, notably those from Egypt and Holland.

Judging.—The judging of competitive exhibits of fruit, even when a few judges only are engaged, is at all times a somewhat difficult matter, and the employment of a large number of judges such as was necessary in the case of a show of this magnitude rendered it necessary to lay down certain rules for their guidance, in order to secure uniformity of judging. Each judge was supplied with a score card on which to record the marks awarded to each exhibit. The score card read as follows:—

<i>Fruit.</i> —Best commercial size	...	...	...	...	10
Colour, finish, skin quality	...	...	...	...	15
Condition :—Soundness, firmness, freedom from blemish, flavour quality of apple	...	...	...	...	25
Uniformity of colour and size	...	...	...	...	15
<i>Packing.</i> —Quality of pack	...	...	...	...	30
General appearance of entry	...	...	...	...	5
					<hr/> 100 <hr/>

The work of the judges was organised by Mr. H. V. Taylor, Deputy Controller of Horticulture, who asked the judges to accept the term "best commercial size" as the size normal to the variety. The judges were also asked not to award extra points for any colouring which might have been specially developed for exhibition purposes. It will be observed that the score card includes the expression "flavour quality of apple." This is a unique feature in a British score card, but its importance is so great that its omission in the past is not easily explained.

The work of judging occupied three days, and on account of the high standard of many of the exhibits the task was extremely difficult, and in many cases before a decision could be reached it was necessary to turn the apples out of their boxes. It is very satisfactory, however, that in every case with one exception a decision was arrived at by the judges themselves. The one case on which an agreement could not be reached was in Class II of the British Empire Section. The first prize in this section was awarded by the judges, but on

the second prize a sharp division of opinion arose. The class was judged by three English and three Canadian judges. Failing agreement between the judges, the matter was referred to an umpire.

The list of prize winners is particularly interesting and instructive to all who are interested in apple growing, but space will only admit of the inclusion here of the awards in the British Empire Section.

British Empire Section.

Class I. 20 boxes of any dessert variety.

- 1st prize. H. A. Whiffen, Hownhall, nr. Ross, Herefordshire.
(*Cox's Orange Pippin.*)
- 2nd „ Robert Stark, Creston, Br. Columbia. (*Cox's Orange Pippin.*)
- 3rd „ Okanagan United Growers, Ltd., Vernon, B.C.,
Canada. (*Jonathan.*)

Class II. 20 boxes of any culinary variety.

- 1st prize. Spalding and District Bulb Growers' and Market
Gardeners' Assocn., Spalding. (*Newton Wonder.*)
- 2nd „ Hubert M. Cobb, Cathedral Chambers, Rochester.
Kent. (*Bramley Seedling.*)
- 3rd „ Ontario Fruit Growers' Assocn., Toronto, Ont.
(*Greening.*)

It will be seen that the Cox's Orange Pippin, whether grown at home or in Canada, proved supreme as the best dessert apple.

Packing.—Exhibitors were not instructed to use any special pack for their apples, but it was generally anticipated that as this was a commercial show, the diagonal pack would be used for boxed fruit. It is perhaps safe to say that most exhibitors did place the apples on their side, but in most sections apples packed 'eye up' were to be seen, while in the Overseas Sections 'stem up' was the popular pack. A striking feature was the number of examples of the 'off set' pack. This pack displays the fruit to advantage, but unless the stems are properly clipped they seriously injure the sides of the fruit in the box. This injury was apparent even while judging was in progress, and became more prominent towards the end of the Show. Experience alone can decide which pack is the most suitable for British varieties of apples, but there is a general impression that the safest way is to use the diagonal pack, placing all the apples lengthwise.

The importance of size selection to secure a good presentation of the pack is one that should be borne in mind by all exhibitors. This was illustrated by the prize winning exhibits

in which the apples had been selected so that they fitted close together in the pack.

Grading and Packing Demonstration.—At a special stand Messrs. Whiting and Turnbull, two of the Ministry's Inspectors, assisted by Mr. Woods, gave daily demonstrations in grading and the box packing of apples. The demonstration was opened by Lady Griffith-Boscawen, and throughout the Show great interest was taken in this section. Numerous inquiries received made it evident that growers are really anxious to familiarise themselves with this system of presenting apples for market.

Scientific Exhibit.—At another stand the Ministry staged educational exhibits. The section contributed by the Long Ashton Research Station showed the results obtained in fruit breeding by the Station, and the results of investigations into various diseases affecting fruit trees. The chemical analyses of samples of soils suitable for fruit growing were also exhibited. The Fruit Preserving Station at Chipping Campden sent an excellent exhibit of preserved fruit and vegetables, and the technical processes were explained by Miss Watson to numerous enquirers. The East Malling Station dealt with the highly important question of stocks and their influence on the fruiting of different varieties. Exhibits were also staged illustrating the natural habit of growth of the different varieties of apples, and the need for adopting pruning methods to suit the variety and the purpose for which the tree is grown. A valuable section of the Ministry's exhibit was that sent by the Pathological Laboratory at Harpenden. Cases were displayed containing very beautifully produced models of insect and fungus pests of fruit trees. Collectively, the Ministry's exhibit was highly appreciated, and the officers in attendance dealt with a large number of inquiries.

Cooking Demonstration.—Although in Canada there are over 100 recognised ways of cooking apples, in this country the apple appears on the table in only a few dishes. The need for educating the public in the various ways in which the apple can be presented on the table was realised by the National Federation of Fruit and Potato Trades' Associations, who arranged for demonstrations to be given by the Marshall School of Cookery. The demonstration was opened by Lady Floud, who pointed out the necessity for a larger consumption of apples in this country alike in the interest of the public health and in the provision of a wider market for the growers' produce.

Cider Making Demonstration.—The National Association of Cider Makers, in conjunction with Professor Barker, Director of the Fruit and Cider Institute, Bristol University, arranged for daily demonstrations in cider-making to show the general public how this delicious home-made “ wine ” is produced.

Overseas Exhibits.—Most of the varieties shown were “ dual purpose ” apples, *i.e.*, they are suitable both for dessert and culinary purposes, Northern Spy and King being notable examples, both of which were exhibited in perfect condition. There were few purely culinary varieties, the principal being “ Greening.” These dual purpose apples were all of even size, securing a great measure of uniformity. As these apples have been successful in the home markets, it may be necessary for growers to consider seriously whether the great degree of specialisation which in the British Section was manifest by the very large Bramley’s and the small Cox’s is either necessary or wise.

The whole section had a very pleasing appearance, and was educationally important as demonstrating the value of good presentation.

The amount of interest taken by the public in the Show is instanced by the fact that the total attendance during the eight days exceeded sixty thousand. The Show also stimulated interest in other towns. The National Association of Retail Fruiterers and Florists organised a Shop Window Dressing Competition throughout the country during the week, and the displays must have been of considerable propaganda and educational value tending to increase the consumption of fruit, which was one of the purposes for which the Show was held.

* * * * *

EGG-LAYING TRIALS.

J. W. HURST.

ALMOST a quarter of a century has passed since the inception of egg-laying "competitions," as such, and it is but the bare truth to say that the subsequent remarkable development of the egg producing industry is to a considerable extent the outcome of the idea which originated with Mr. Holmes Tarn, one of the founders of the old Utility Poultry Club, to which practical effect was first given in the autumn of 1897. In that year the first competition in the world was held at Northallerton, Yorkshire, where under the management of Mr. Simon Hunter twenty-eight pullets competed for prizes during a period of sixteen weeks. The beneficial influence of that small beginning in England has since extended to every poultry-keeping country in the civilised world. It may be asked: "What are the benefits that result from egg-laying tests?"—to use the word that has now been generally adopted as being more suitable than "competition."

Improved Stock.—The principal outstanding good, so far as it affects the poultry industry generally, or, in other words, the whole body of poultry keepers, is the gradual, widespread levelling-up of the laying qualities of the stock of the country. This is not to say that unprofitable fowls do not still exist to a very considerable extent, but that the increasing high fecundity that distinguishes egg-laying strains is effecting a gradual but sure improvement in the quality of the stock.

Sittings of eggs, day-old chicks, and pullets, the product of breeding pens specially selected in accordance with records of actual performance, are annually distributed among the general body of poultry keepers to an ever increasing extent. Amateurs who have time and opportunity to engage in breeding operations on their own account are learning the value of the trap nest, and they are moulding their methods on the lines of the more skilled and experienced specialist breeders. In the aggregate this is an influence that is so far-reaching and so important that its ultimate effect cannot be estimated. Nevertheless, at this juncture, after a quarter of a century of testing and comparing we can at least appreciate the tendency by a recollection of the average egg yield twenty-five years ago.

Increasing Facilities.—It is evident that the benefits would not be so generally available but for the continuance of the

tests. Moreover, the tests are in themselves a perpetual advertisement and reminder of the benefits that accrue from strain, in contradistinction to breed. To this end the Press, both daily and technical, has lent its aid ungrudgingly, and in its monthly and annual reports has insistently emphasised the differences that may exist in the egg yield of birds of the same breed or variety, fed and kept in the same way and under equal conditions.

In other words, the value of strain is being inculcated continually in such a way that poultry keepers can hardly remain for long in ignorance of the fact that for egg-production it is a matter of the first importance to secure birds of good strain or proved family fitness. Further, it is by the same means that poultry keepers are enabled to get into touch with breeders of strains of proved prolificness. The published records of egg-laying performance make it possible for the public to compare results, and to familiarise themselves with the names of breeders whose birds are consistent in maintaining a relatively high level of prolificness.

Without the holding of the tests and the publicity given to the results, the public would have no independent check upon the claims of breeders who offer pullets and cockerels, day-old chicks, or sittings of eggs for sale. It is to the egg-laying trials that the public must look for authoritative proof of the reliability of egg-laying strains, and the published records of their tests serve to safeguard the buyers of eggs or birds to a large degree against the unscrupulous advertiser.

Position of Specialist Breeders.—This brings us to a brief consideration of the position of the specialist breeders—those whose work it is to produce and maintain the strains of highly prolific layers. Theirs is a very special and peculiar branch of the industry, the creation and continuance of which depends to a considerable extent upon the holding of egg-laying trials. The tests are to them at once an incentive and an advertisement. Without published records they would have less inducement to keep their stock up to the required level, and without the authoritative character of that publicity their financial rewards might be insufficient to recompense them for their skill and labour.

Egg-laying tests are to the specialist breeders of the egg-laying strains, what the fanciers' poultry shows are to the breeders of standard bred stock; they keep their stock up to the mark and bring them customers. This is, of course, the more directly

commercial influence of the tests, and is of primary importance to those most concerned—the comparatively few specialists. Important as it is to this group of producers it is necessary for others to bear in mind that the whole superstructure of the egg industry is also very directly influenced in the ways briefly indicated. The specialist breeders are essential to the continued development of the industry, inasmuch as they provide the sources of supply upon which the generality of poultry keepers depend, either directly or indirectly, for the maintenance of the prolific strains that serve to level-up the egg yield of the country by improving the character of the stock as a whole.

Essential Safeguards.—It follows from the foregoing that the future of the egg industry must depend very largely upon the safeguards that are imposed, in the form of rules and regulations, by those responsible for the conduct of egg-laying tests. The tests must be so hedged about with what may be called “safety first” rules that the best interests of the industry as a whole—not of the specialists alone—are secured. Any tendency that is seen to be leading to ultimate harm must be checked at the earliest possible moment by the modification of laying test rules and regulations. That this is essential to permanence can scarcely be gainsaid.

At the present time there are two such tendencies that are undoubtedly the cause of considerable anxiety to those who have the lasting interests of the industry at heart. These are signs of weakness in stock, and lack of size in the eggs. Both threaten the future of egg-laying strains and are inimical to the best interests of the industry as a whole. The question of weakness is obviously mainly referable to the breeders most nearly concerned, but the lack of size in the eggs may be very largely remedied by those who make the rules regulating the scores and awards.

It should be sufficiently evident to breeders that the mere maintenance of their strains, and certainly their improvement, is primarily dependent upon stamina and soundness of constitution. Without these essentials the most highly fecund fowls in the world cannot continue to perpetuate their kind, and without some measure of permanence strain-making must fail of its object. That fecundity, vigour, and fertility are not incompatible, is a fact that has been established by experiment under scientific control; and to allow any loss of breeding qualities in fecund strains, as the result of faulty selection, is to court disaster.

Replacement of Dead Birds.—A way has been suggested by which controllers of laying tests may exercise a salutary influence on the maintenance of stamina and constitutional fitness. That is, by refusing to countenance any rule that permits breeders to replace any fowl that dies during a testing period. To permit any such replacement is held to encourage the taking of risks relative to the maintenance of vigour and vitality, and it may quite possibly benefit the breeder concerned in a way that is undesirable—in view of the object of egg tests. Any rule with such possibilities would appear to be quite wrong in principle.

An alternative method, for application in order to avoid penalising a breeder in the event of the death of a bird during a test, was put forward by a speaker at the recent World's Poultry Congress. The method advocated involves the adoption of a different system of calculation, but however satisfactory this might be to the individuals concerned it would seem to evade the main point, which is the importance of imposing checks to degeneracy.

Quality and Size of Eggs.—As regards the prevailing tendency to loss of size in the eggs there is more to be said. There is a very general opinion that it is time to formulate rules and devise means to secure and maintain the desired standard of weight and size in eggs, together with texture of shell and other qualities that, in combination with numbers, are most required. It is equally important, however, to bear in mind that none of these qualities can be maintained, even if they are attained, without the necessary vigour and character in the stock.

As illustrating the wide difference that may exist in weight, mention was made at a conference at the Harper Adams Agricultural College last year of one pen of six birds laying 895 eggs, of which only 14 were under 2 oz. in weight, whereas another pen of six birds laid 939 eggs, of which 223 were under 2 oz. As the 2 oz. egg is the most popular for the breakfast table it is evident (in view of foreign competition) that any method of valuation in laying tests that encourages approximation to this standard is preferable to a method of numerical scoring that would tend to the encouragement of the small egg.

There are those who contend that market value would be the correct standard if pullets were the only egg producers: but as hens in winter are not as a rule highly productive, and foreign imports are greatly reduced, the eggs of pullets secure an artificial value if judged by this standard. It is therefore argued

that the true test of value is the quantity of human food produced, subject to the approximation to standard size. The attainment of the ideal depends upon judgment in selection and mating, the time of hatching, and skill in rearing and feeding.

The need is for numbers, plus quality and standard size. Allowance must obviously and quite reasonably be made for the normal size of pullets eggs (a little below standard requirements), but it is not at all desirable that birds producing a big number of very small eggs should be allowed to win in laying tests.

Regulations for Scoring at Laying Trials.—In this connection it is of interest to note the regulations which govern the award of points for eggs laid at the important laying trials organised respectively by the National Utility Poultry Society in co-operation with the Great Eastern Railway Co. at Bentley, and by the Harper Adams Agricultural College, Newport, Salop.

The National Utility Poultry Society's regulations provide that eggs laid during the first four weeks of the trials, and weighing $1\frac{7}{8}$ oz. or more; during the second four weeks those weighing $1\frac{5}{8}$ oz. or more; and during the remainder of the test those weighing 2 oz. or more, are scored at unit value as *first grade*. Any eggs laid during those periods weighing less than the respective weights fixed for first grade eggs, but not less than $1\frac{5}{8}$ oz. are assessed as *second grade* and scored at unit value. The number of second grade eggs allowed to score for competition purposes is definitely limited, and eggs weighing less than $1\frac{5}{8}$ oz. are not scored at all.

The Harper Adams College regulations provide that for purposes of valuation, eggs will be divided into first grade, to be valued at average market price, and second grade at average market price less 25 per cent. First grade eggs must score 2 oz. or over throughout the trials. During the first 16 weeks of the trials, eggs weighing less than 2 oz. will be assessed as *second grade*, and for the remainder of the trials only those eggs weighing less than 2 oz. but not less than $1\frac{3}{4}$ oz. will be assessed as *second grade*.

The object of these rules is to make due allowance for the normal laying of small eggs in the early stages, but to penalise breeders whose birds do not lay larger eggs within a reasonable period.

Side Issues.—Apart from the main and most important purposes of egg-laying trials, they have already been productive of many results in connection with what may be termed "side issues," that are of a very direct practical value to poultry

keepers as a whole. It often happens that the monthly or annual reports of the various tests contain more or less casual reference to matters of considerable interest, those who conduct such tests being in an exceptional position to make observations on matters affecting management generally.

For example, during the drought this year attention was directed to the fact that a long continuance of dry weather is influential in causing a slight but general falling off in the weight of eggs during the period of high production, but when the rate of production is slower the size is more fully maintained, despite this influence. Again, the fact is emphasised that when penned, the best layers will use up the herbage in their runs more quickly than those that are less productive, thus emphasising the importance of vegetables in the dietary of laying stock.

This latter fact has been further accentuated as a side issue arising out of the inclusion of a section in the eighth Irish egg-laying test, in which the birds were fed on dry mash and grain for the purpose of comparing the productive results with those of birds fed on wet mash and grain. It was found that, whereas the grass in the runs of the latter kept in reasonably good condition, the runs in the dry mash section were quite bare of grass by Christmas (the testing starting on 1st October), and that extra green food had to be given daily to the birds in this section to make good the deficiency.

Many similar instances of the practical educational value of laying tests, additional to the inculcation of the value of strain, could be given, and those who conduct and report on such tests could usefully amplify their notes on the many side issues that inevitably come under their notice, most of which have a more or less important bearing upon the economy of egg production.

Experimental Extension.—Although the testing of strains for prolificness must remain the chief object, there are certain directions in which the work may be extended with advantage, and the Harper Adams Agricultural College authorities are certainly justified in regarding the Male Bird Progeny Test as a natural outcome and development of egg-laying tests. In this direction there is an undoubted need for investigation, to discover the worth of male birds by their breeding behaviour, and the first aim of the College authorities is to obtain definite data from which provisional conclusions may be drawn.

Meanwhile, it may be noted that some interesting results have been secured at the Munster Institute in connection with the tests made by the Irish Department of Agriculture. The Depart-

ment purchased the best pen of pullets in the 1917-18 egg-laying test and mated them with male birds bred from highly-prolific hens, with the result that not one of the pullets reared from this stock laid less than 200 eggs in the first year, one producing as many as 299 eggs. The chief point of interest, however, is the breeding record of the cockerels among the progeny. Four of these cockerels bred the pullets that made up the pens which gained first, second, third, and fifth places at the conclusion of the eighth Irish egg-laying test which ended in August, 1920. Further, the winning pen consisted of six daughters of the champion hen in the 1917-18 test. In the winter following the 1917-18 test the champion hen was mated to one of the males mentioned above, and one of her pullets proved to be the champion layer in the last test with a record of 287 eggs in eleven months—the period of the Irish tests. This pullet finished the year with a total of 309 eggs, and her dam's record was 311 eggs in 365 days.

An extension in another direction is being made in the 1921-22 egg-laying test at the Harper Adams Agricultural College, in connection with which an experimental use of electric light in the houses is to be made in one section. This is a very desirable experiment in view of the several accounts of the successful application of light in inducing a higher egg yield that have been received from America, and the absence of authoritative data in this country.

Whatever is said and done, the fact remains that the primary purpose of egg-laying trials is to prove the prolificness of strains, the value of their produce in respect to the size and quality of the eggs, and the constitutional fitness of the stock—a fitness that is not incompatible with high fecundity. Further, the continuance of authoritative tests is a commercial necessity, and is essential to the progress of the egg industry in this country.

* * * * *

AGRICULTURE BEHIND THE LINES IN FRANCE.

LIEUT.-COLONEL J. H. FORRESTER ADDIE, C.B.E.,
*Late Colonel, Royal Welsh Fusiliers, and late Deputy Director
of Agricultural Production, G.H.Q., France, and*

CAPTAIN A. T. A. DOBSON,
*Late Lieut.-Colonel, Hampshire Regiment, and late Assistant
Director; Assistant Secretary, Ministry of Agriculture
and Fisheries.*

PART II.—Up to the Armistice, and after.

THE previous article took the reader up to the somewhat tragic termination of the agricultural undertaking in the region of Roye. Before, therefore, dealing with the subsequent activities of the Directorate, after the great German advance in the spring of 1918 had been brought to a standstill, some information as regards the progress of the vegetable garden undertakings, which already existed throughout the area of the British Army, may not be out of place.

As explained in the first article, it had originally been intended that the Directorate should be responsible for supervising all agricultural activities in France. Although, therefore, the main undertaking at Roye had absorbed most of the time and energy of the Directorate's officers, time had nevertheless been found to take stock of all the lesser undertakings that already existed and to afford advice on the subject of the cropping of Army and other unit gardens, and generally to organise the provision of the necessary implements, seeds and manures required.

At the time of the great German offensive, the total acreage of the vegetable gardens in the British Army zone, exclusive of the main undertaking at Roye, amounted to 7,496 acres, of which at least 3,000 acres were devoted to potatoes. Another 7,000 acres had been marked out for cultivation, although operations had not actually been started. A considerable proportion of the above acreage, especially in the areas of the Third and Fifth Armies, and later of the Second Army, was affected by the German advance, but over 4,000 acres still remained in a flourishing condition when that advance had spent itself.

Until the military situation showed some sign of settling down, it was naturally impossible to consider the future of the Directorate, or whether it had any future at all. For the moment, the

possibility of undertaking a new agricultural venture similar to that at Roye was contemplated, and a visit was paid to the rich agricultural country in the vicinity of Orleans, where suitable land could have been obtained. The need for all personnel for work on the lines of defence, and the necessity for the tractors being tuned up again after their long road journey from Roye to Rouen, however, resulted in any further project being abandoned.

In the meantime a new problem had arisen. The German advance on the Amiens front was, as will be remembered, followed by a similar advance on the Second Army front in the neighbourhood of Ypres. As the result of both these advances, the French civilian population was forced to evacuate a large area which it had believed it could occupy indefinitely with safety. This area had in the ordinary course been planted, chiefly with wheat, and in due course would have yielded a rich harvest.

The prospect of a world shortage of food could not be overlooked, and the French Authorities consequently did not view with equanimity the prospect of losing the harvest, even from the 200,000 acres which were involved. They accordingly began to urge on the British Authorities at G.H.Q. the importance of steps being taken to save the harvest in this area, which had now become a *Zone Interdite*.

It was finally decided that the Directorate should not be abandoned, but should be retained in a curtailed form for the purpose of organising the harvesting of this area on a proper basis, and in June the Directorate was instructed to begin operations again. The French Government undertook to pay for the labour of harvesting, to place their interpreters at the disposal of the British Authorities, and to allow the Directorate to use all available agricultural machinery belonging to the evacuated civilian population which could be found in the area. Through the agency of the agricultural officers with each Army, large quantities of this machinery had been salvaged in the course of the retreat and collected into convenient dumps.

The task, however, was not an easy one. As has already been indicated, the labour supplied in the first instance to the Directorate and formed into agricultural companies had been drafted for operations in connection with the construction of defences, and preparations were by now already afoot for the great Allied offensive which was to terminate in the Armistice of November, 1918. The reconstruction of the Agricultural Companies there-

fore for harvesting operations presented great difficulties, and it was not until the 13th August that it was possible to re-collect sufficient personnel to form two of these companies.

Then again the difficulties of actual harvesting were almost insuperable. Many rich areas were so overlooked by the enemy, that in many cases the work of harvesting could only be done under cover of darkness. Even where the work could be done by day the workers were frequently shelled. Gas, too, was largely used by the enemy, with the result that the use of horses became almost impossible until the affected area had been cleared and the noxious fumes dissipated.

Again, while the corn was young, trenches had been dug, with their belts of protective wire, the whole of which disappeared from view when the corn came to maturity. These naturally proved tiresome obstacles when the cutting of the crop revealed their presence.

The operations were full of incident. On the forward slopes of the Mont-des-Cats—that landmark so well-known to the British troops in France—harvesting was in full progress one night when a heavy hostile barrage was opened on the scene of the operations. The N.C.Os. in charge quickly grasped the situation and, regardless of danger, unhitched all the teams from the machines. Men and horses were taken through the barrage to cover on the other slopes of the hill until the shelling stopped, when work was resumed and the harvesting completed.

In many localities the corn crop extended right up to and in advance of the front line trenches, and even in these cases, in order to save as much as possible, parties of men from units holding the front line voluntarily went out and with any implement that came to hand, severed the ears of corn and sent them in sandbags to selected dumps on the returning ration wagons. No fewer than 150 bags of threshed wheat were saved by this method alone on one Corps front.

One more incident may be recalled. A small area of corn near the front line had to be cleared. The night was pitch dark, and the ground was unfamiliar to the reapers. It was under such observation by the enemy by day that the result of one night's work would readily be apparent to the enemy on the next day and they would naturally take steps to prevent any further harvesting. It was essential, therefore, that the crop should be cut and removed at one cutting. All work had to be done by hand and every sheaf of corn as it was cut had to be carried to waiting wagons, on which it was taken to the back areas to be

stooked and dried. Seventeen men with scythes cut the six acres in three hours—a record that it would be difficult to surpass even by day, let alone under similar conditions.

It was only the devotion to duty displayed by the harvesters on occasions like those referred to that enabled so much work to be done.

Early in August the great offensive began on the Amiens front, and as the advance progressed, the acreage to be harvested increased, with the result that work was continued until late September. The wheat clung to the ear in a remarkable way, and the dry weather in October helped to dry the newly-cut stooks.

The total acreage harvested in Army Areas with the small personnel at the disposal of the Directorate amounted to over 18,000 acres. The whole of the harvest in this area was stacked, thatched and, with the exception of a few stacks, eventually threshed by British labour.

Before leaving this subject, attention is directed to one of the illustrations accompanying this paper (Fig. 3), which shows the actual harvesting operations in progress round a British 6-in. howitzer located in its actual battle position behind the British lines, and therefore liable to be in action at any moment.

The nature of the great British offensive was such as to inspire the feeling that as the Germans were cleared out of the occupied territory, they were being cleared out for the last time. Consequently the way was soon opened for the establishment of another G.H.Q. farm on the lines of that described in the first part of this paper. At the opening of their offensive, the Allies, as is now common knowledge, were inferior in numbers to the enemy, the possibility of another winter in the field had to be reckoned with, and it was desirable that every comfort should be provided for the troops during this period. All this tended to hasten the Authorities at G.H.Q. in their decision as to a new undertaking.

During August careful inspections were made with a view to the selection of a suitable area which could be cultivated with the least interference from the French civilian population. There were many considerations to be taken into account, such as transport facilities, access to supply dumps, and a plentiful supply of water. There were areas in the Department of the Pas-de-Calais which presented many advantages, but few sites possessed such unique features as the site ultimately selected, namely, the triangular plateau lying in the fork of the rivers

Ancre and Somme, east of the point where the two rivers converge at Corbie. The centre of the plateau more or less marked the limit of the great German offensive of 1918, from which they had now been finally forced back.

This area was completely devastated, and the ruined villages scattered all over it offered no inducement to the French inhabitants to return. On the northern side was the broad gauge railway from Amiens to Arras, following the valley of the Ancre, while on the southern side transport facilities were available by barge on the Somme canal. In addition, the area was richly served by trunk and lateral roads, not to mention the military railways which had been utilised for supplies during the year 1917. The French Authorities were willing to allow cultivation to proceed, and under certain decrees passed by the French Government they were able to secure for the British military authorities what amounted to security of tenure.

The flat top of the plateau comprising the area to be cultivated was some 1,500 to 3,000 yards wide and sloped away to the rivers lying to the north and south, either precipitately or in a series of terraces, a formation often found in a chalk country. On the higher portions of the plateau, which was about 350 ft. above sea level, the land was a deep light loam, but on the slopes towards the rivers the soil became shallower and chalk was found at a very slight depth below the surface.

There had been no water on the plateau itself prior to the construction of water points by the Military Authorities, and this no doubt accounts for the fact that all the villages were to be found not on the high ground, but on the river banks, and thus at a much lower elevation. It was doubtless a matter of great difficulty, therefore, for the inhabitants to cart manure from the villages in the valleys, where it was available, to the upper lands.

It is quite certain that the upper lands were suffering from lack of manure. On the other hand, they were eminently suitable for the growing of cereals and roots, such as potatoes and forage crops. Winter wheat had been the rule of the district, and there were many acres of excellent lucerne and clover crops which proved of great value for the horses. Moreover, some of the land had been ploughed for potatoes.

In September the Directorate prepared for renewed operations on a large scale.

They were at this time still located at Le Touquet, whither they had returned after the German offensive had opened. They

continued to retain their headquarters at this point, where a large vegetable garden had been established, partly for experimental purposes, but an advance headquarters was opened early in October in one of the wrecked houses in the square at Corbie, which, as indicated above, lay at the junction of the Somme and the Ancre, at the foot of the hill leading to the plateau.

The area was at once divided into some 9 blocks, each consisting of about 2,000 acres, each in charge of a block commander, who, as a farmer, was responsible for its cultivation. Two of the original agricultural companies were collected and assigned to the work and were reinforced later by at least half of a third company. These companies were distributed over the 9 blocks, so as to ensure that there was a nucleus on each. Their headquarters were located at two dumps situated at suitable distances along the main Corbie-Bray road, which practically bisected the whole area. From these two dumps the block commanders drew all their stores and supplies.

Two Auxiliary (Petrol) Companies (Agricultural) were also allocated and from these were drawn the drivers and mechanics required to deal with the machinery which had been railed up from Rouen. The headquarters of each of these companies was located within a reasonable distance of the railhead, touch being maintained between these companies and the different blocks by motor transport. Apart from agricultural machinery, 280 horses were available and a large quantity of agricultural implements had been salvaged from the French villages.

The housing for the necessary personnel had to be specially constructed. By this time the British Army advance had penetrated far into the area hitherto occupied by the enemy. The British farm at Corbie was, therefore, one of the only large installations between the base depots and the advancing army. The length of the lines of communication was therefore very considerable, and every effort had to be made to obviate the sending on from the base of heavy stores like huts, except for the use of the advancing troops. Fortunately, the area selected for cultivation contained stores of every kind.

Here was a derelict aerodrome with the canvas of the hangars flapping in the breeze; here was a stranded tank; here an ammunition dump containing shell of any size up to 9-in. or more. Here again were huge collections of empty ammunition boxes.

The construction therefore of suitable hutments both for men and



Photo, Crown Copyright

FIG. 3.—Harvesting Operations close behind the Fighting Front.

[Imperial War Museum.]



FIG. 4.—Air photograph (taken specially for the Directorate by the R.A.F.) showing part of the G.H.Q. Farm area. reclaimed, ploughed and planted. The trench system is clearly visible, even where it has been filled in.

horses only required a little imagination. Field-gun ammunition boxes, made to hold 4 shells and their cartridge cases in one, when filled with earth made a very suitable and stable material with which to construct the sides of a hut, and there was no lack of corrugated iron for the construction of the roof.

In a very short time therefore layouts for the various hutted camps were prepared, and construction went forward rapidly, and before long a series of camps was completed, with all accessory buildings, roadways and paths and even, in some cases, adorning shrubs. The importance of these camps will be appreciated later.

The first duty that fell to block commanders was to survey their respective blocks with a view to seeing how much land could be ploughed straight away without any preliminary preparation, and to get tractors put on to such areas without delay. As regards the remainder, the work of clearing was handed over to companies of German prisoners of war.

As has already been intimated, across the plateau, roughly from north to south, ran the front line marking the limit of the German offensive of 1918. Here were two front trench lines with all their reserve lines and communication trenches. Naturally these were somewhat more numerous on the British side of the lines, namely, on the defensive side. Moreover, all trenches were protected by heavy belts of wire of varying thicknesses and there were, in addition, innumerable strong points which were even more heavily protected.

The work of preparing the ground for cultivation did not therefore consist merely in filling in trenches, but involved the tearing up and stacking at suitable points of all the wire and other obstructions which encumbered the ground. Even when the ground had been cleared, the troubles were not at an end. There were many localities in the area where, either on account of the existence of concealed enemy battery positions or suspected dug-out systems, the shelling by the heavy British artillery had been intense. The type of shell used was an armour-piercing variety with a delay action fuse, intended to destroy dug-outs at some distance below the ground level. Where no dug-out existed the shell merely penetrated to a considerable depth and then exploded. The result was that, owing to the depth to which the shell had gone, the force of the explosion merely formed a subterranean cavity of varying dimensions, without leaving a crater on the surface, and a cursory examination of the ground did not reveal anything unusual.

The presence of these shell holes was a great source of hindrance to tractor ploughing. The tractor would proceed without mishap over an apparently untouched area, but as soon as it passed over one of these submerged cavities, its weight proved too much and down it went into the shell hole below the surface, which in most cases was quite large enough to hold the entire tractor, and operations had to be stopped until a detachment of prisoners of war had excavated sufficiently to enable the tractor to be dragged out.

By the middle of October, ploughing was in actual operation but by the end of January, 1919, ploughing more or less came to an end on account of the reduction of available personnel consequent upon demobilisation. By the latter date, however, an area of no less than 6,238 acres had been levelled and prepared for ploughing, 4,000 acres had actually been ploughed, and of these over 800 acres had been sown with wheat. In one area alone there was practically one complete block of about 600 acres of wheat.

Fig. 4 is an aeroplane photograph taken for the Directorate by the R.A.F. in the Field at a height of about 8,000 ft., which shows the ploughed area round a section of trench system, which was subsequently planted with wheat. The trench lines are clearly visible, and the area ploughed is easily differentiated from the area not ploughed. It should be noted, however, that even on the ploughed areas there is a short length of trench line which has been filled in, but is still clearly visible from the air.

The last act of the Directorate before being themselves demobilised was to effect the sale of the whole area to the French Authorities, including huts, tractors, other machinery and tillages, such an eventuality already having been allowed for in the agreement under which the land was originally rented for cultivation. Thus, the Department of the Somme may be said to have been more favourably situated than any other devastated area in France in that here, at all events, over a comparatively small area the inhabitants could be allowed to return to find not only areas cultivated or ready for cultivation, but even rough homesteads prepared for them, in the shape of the hutted camps which had been constructed at various points for the housing of the British personnel engaged.

By the 31st March, the Directorate may be said to have been formally wound up and the demobilisation of personnel completed.

During the period subsequent to the Armistice much had been done by the Directorate in the direction of education. Educational courses were arranged not only on the G.H.Q. farm but also on the various army farms, while some excellent courses on a broader basis were held at certain veterinary hospitals. In addition, demonstrations in tractor ploughing were arranged whenever possible and proved very popular.

Although not an enterprise coming under the auspices of the Directorate, which was not then in existence, no account of the agricultural undertakings in the war zone would be complete without a brief reference to what was generally known as the G.H.Q. Hay Scheme.

In 1917 the Germans began to withdraw to the Hindenburg line and large tracts of land covered with grass fell into the hands of the British Armies. It soon became evident that with a little organisation this land could be turned to good account, and it was therefore decided that as much hay as possible should be gathered to save tonnage.

The area was surveyed and suitable portions were wired in and placed out of bounds to troops, and all available mowing machines were collected from the area. A considerable area of hay proved worth reclaiming, and a detachment of some 200 skilled men were furnished for the cutting operations, while reinforcements of unskilled labour were provided for the actual hay-making. The work started on the 5th June, 1917, and for a week or so the weather was favourable. The last part of June, however, contained at least one wet week, while the latter end of July was continuously wet. Notwithstanding this, 4,699 tons of hay were cut, only 233 tons being subsequently rejected by the Central Purchase Board. The remainder was prime quality.

In conclusion a word of thanks is due to all the French Authorities with whom the Directorate came in contact. No praise can be too great for the help and assistance rendered on all occasions by officers of the French Mission and by the various officials and agricultural officers of the French Civil Authorities, without whose loyal co-operation and sympathy the Directorate would have found it very difficult, if not impossible, to carry out the important work entrusted to them.

THE COST OF HORSE LABOUR.

ARTHUR G. RUSTON, B.A., B.Sc. (Lond.), D.Sc. (Leeds).

Lecturer in Farm Economics at the University, Leeds.

SINCE 1908 a great deal of time and attention has been devoted in the Department of Agriculture of the University of Leeds to collecting data as to the costs of production of various farm crops and other produce. Records are available from three farms to 1912; from six farms from 1912-1914; during 1919-1920 eleven farms were being costed right through; and at the present time that number has been increased to thirty-five. On these farms time sheets are in use, so that the amount of labour, whether manual, horse or tractor, expended on each crop or head of stock can be readily ascertained, and monthly records are kept as to the quantity of food—whether home-grown or purchased—that has been consumed by the stock. The farms are visited periodically, monthly wherever possible, and after each visit a monthly summary is sent to the farmer concerned, showing the average weekly cost of upkeep of his cows, feeding bullocks, young stock, working horses, sheep, pigs and poultry.

From the monthly summary of labour he is able to see the number of days his horses are working, and therefore to ascertain readily the average cost of horse labour per working day. The practical value of these costings to the farmer is greatly enhanced if they are given to him periodically and not kept until the end of his financial year. At the end of each year the monthly summaries from each farm are collected and a

TABLE I.

Cost of Horse Labour, 1919-1920. No. of Farms, 11. No. of Acres, 2,057.

<i>No. of Horses 66.</i>				<i>No. of Working Days 14,278.</i>			
	£	s.	d.		£	s.	d.
Value of 66 horses ...	4,633	12	6	Value of 64 horses ...	4,136	0	0
Purchase of 2 horses ...	106	2	6	Sale of 4 horses ...	110	10	0
2·1 acres grass ...	371	16	2	Cost of upkeep of 66 horses	4,028	15	5
75 tons 12 cwt. hay ...	417	12	8				
89 tons 5 cwt. straw ...	243	14	7				
53 tons 19 cwt. roots ...	115	10	6				
444 quarters oats ...	746	19	9				
36 tons 3 cwt. of purchased foods ...	761	19	4				
Labour ...	213	6	2				
Incidentals ...	664	11	3				
	£8,275	5	5		£8,275	5	5

balance sheet prepared, from which the yearly cost of upkeep of various head of stock can be readily determined. When the results from each farm have been thus obtained, the whole results are collected into one table from which the average cost of horse labour, if that is required, over the whole of the farms concerned can be determined for that particular year.

In 1919-20, on eleven farms whose total area amounted to 2,057 acres, 66 working horses were kept, and according to the time sheets these horses were engaged during that period in performing 14,278 days' work.

From Table I it will be seen that during the year 1919-1920 the net cost of maintaining 66 working horses amounted to £4,028 15s. 5d. The detailed summary of the costs is given in Table II:—

TABLE II.—*Summary of Cost of Horse Labour.*

—	Total cost of upkeep per year of 66 horses.	Cost per horse per year.	Cost per horse per week.	Cost per working day.	Per- centage cost.
	£ s. d.	£ s. d.	£ s. d.	s. d.	
Grazing	371 16 2	5 12 8	0 2 2	0 6½	8·8
Hay	417 12 8	6 7 0	0 2 6	0 7	10·2
Straw	243 14 7	3 13 10	0 1 5	0 4½	5·9
Roots and vetches ...	115 10 6	1 15 0	0 0 8	0 2	2·9
Home-grown corn ...	746 19 9	11 6 4	0 4 4	1 1	19·1
Purchased corn ...	761 19 4	11 10 7	0 4 5	1 1	19·1
Total food	2,657 13 0	40 5 5	0 15 6	3 10	66·0
Labour	213 6 2	3 4 8	0 1 3	0 3	4·5
Depreciation	493 5 0	7 9 5	0 2 10½	0 8½	12·5
Incidentals	664 11 3	10 1 4	0 3 10½	0 11½	17·0
Total cost	£4,028 15 5	£61 0 10	£1 3 6	5 9	—

Table II shows that the yearly cost of upkeep per horse on the 11 farms amounted to £61 0s. 10d., the weekly cost £1 3s. 6d., and the cost per working day 5s. 9d. Of the total cost the food bill represented 66 per cent., incidental expenses 17 per cent., depreciation 12·5 per cent., and the labour bill 4·5 per cent.

The average food consumption per horse varied considerably on the different farms, as shown in Table III.

The roots consumed would allow for a daily consumption of 12 lb. for a period of 5 months; hay for a consumption of 10½ lb. per head for 8 months; straw for a consumption of 12 lb. per head for 8 months; and the concentrated foods for a daily ration of 9½ lb. per day for the whole year, or 13 lb. per day for 8 winter months and 3 lb. per day for 4 summer months.

TABLE III.
Food Consumption per Head per Year.

	<i>Maximum.</i>	<i>Minimum.</i>	<i>Average of 11 Farms.</i>
Grazing	3·6 acres	0·9 acres	1·4 acres.
Roots	24 cwt.	—	10 cwt.
Hay	40 cwt.	5 cwt.	23 cwt.
Oat straw	54 cwt.	6 cwt.	27 cwt.
Oats	112 bush.	40 bush.	54 bush.
Purchased concentrated foods ...	14 cwt.	3 cwt.	11 cwt.
Total weight of concentrated foods	46 cwt.	24 cwt.	31 cwt.

If all the concentrated foods were supplied as oats, each horse would require 10 quarters per year, or the produce of 2·2½ acres. During the season 1919-1920, on the 11 farms costed, the average cost of grazing amounted to £3 6s. 0d. per acre; vetches, £13 12s. 9d. per acre; roots, £1 10s. 0d. per ton; hay, £4 15s. 0d. per ton; straw, £2 15s. 0d. per ton; and oats, £1 19s. 0d. per quarter.

Ninety-five per cent. of the roots, 85 per cent. of the hay, and 92 per cent. of the straw fed to the horses on these 11 farms were home-grown. Of the concentrated foods consumed, 62 per cent. were fed in the shape of home-grown oats.

Assuming that only home-grown foods are fed, and that these are charged at average cost of production prices, the average cost of food per horse per year would have amounted to £35 17s. 9d., or 13s. 10d. per head per week, instead of £40 5s. 5d. per head per year, or 15s. 6d. per head per week, which was found to be the actual food bill per horse.

The incidental expenses per horse on the 11 farms amounted to £10 1s. 4d. per year, or 3s. 10½d. per week, or 11½d. per working day, and constituted 17 per cent. of the total cost of upkeep. They were made up as follows:—

	£	s.	d.
Shoeing bill	4	2	6
Saddler's bill	3	8	6
Veterinary expenses	12	6	
Proportionate share of rent of buildings	12	0	
" " rates " " 	3	6	
Cost of water and light	7	6	
Proportionate share of insurance and other incidentals	14	10	
	<hr/> £10 1 4 <hr/>		

Fortunately, farriers' charges are now coming down and 14s. will at the present time in many districts cover the cost of a new set of shoes.

On the farms in question the depreciation works out at an average of £7 9s. 5d. per horse per year, or 2s. 10½d. per week, or 8½d. per working day. The depreciation of horses varied considerably on the various farms according to the system of horse management adopted. The depreciation of a horse is the difference between its "buying-in" price when it enters the stable, and its "selling-out" price when it leaves, and every effort has been made to distribute that difference as evenly as possible over the number of years that the horse remains on the farm. Although in 1919-1920 on the 11 farms mentioned, the average cost of upkeep per horse per year amounted to £61 0s. 10d., or £1 3s. 6d. a week, and the cost of horse labour per working day amounted to 5s. 9d., the costs were found to vary considerably, namely—

- (a) From year to year on the same farm;
- (b) From month to month on the same farm during the same year;
- (c) On different farms at the same time according to the management of the horse labour.

(a) The following table gives a summary of the yearly variations in the cost of horse labour on Farm A from 1914 to the present time :—

TABLE IV.

Year.	Yearly cost of upkeep per horse.	Weekly cost of upkeep per horse.	No. of working days per horse per year.	Cost of horse labour per working day.
	£ s. d.	£ s. d.		s. d.
1914-15	31 10 0	12 1	265	2 4
1915-16	38 15 0	14 11	258	3 0
1916-17	42 7 6	16 3	259	3 3
1917-18	52 3 4	1 0 1	248	4 2
1918-19	58 8 0	1 2 5	232	5 0
1919-20	63 4 9	1 4 4	218	5 10
1920-21	60 15 0	1 3 4	216	5 7

If the example quoted can be taken as typical of other farms, it would appear that the cost of upkeep of horses reached its maximum during the year 1919-20, and that while it is perhaps too much to hope that the average cost of upkeep will quickly fall to its pre-war level, yet we may reasonably hope that it will fall again before long to the 1917-18 or possibly 1916-17 level. Owing possibly to the shortening of the hours of manual labour under the decisions of the Wages Board, there has been a noticeable diminution in the number of working days per horse per year, and this was still further accentuated when a tractor was introduced on the farm in 1919-1920. In every case inves-

tigated by the writer, one effect of the introduction of a tractor on a farm has been without exception to increase the cost of horse labour per working day, because, owing to the fact that at certain times of the year, such as hay time and harvest, horses are absolutely essential, the introduction of a tractor is rarely accompanied by the selling off of its equivalent of horses. In consequence, there is a decrease in the number of working days per horse per year, and a corresponding increase in the cost of horse labour per working day.

(b) The monthly variations in the cost of horse labour will be determined mainly by the variations in the cost of feeding and in the number of days per week the horses are fully employed. More time will be usually lost in the summer than in the winter; the busy times will be hay time, harvest, and during the autumn and spring when the ground is being prepared for winter and spring corn. As already stated by Orwin,* the period of maximum unemployment for horses will usually fall between hay time and harvest.

Figures from Farm D show the monthly variations for the year 1920 in the cost of horse labour. This is a mixed farm of 205 acres, 105 of which are arable, and on which 5 working horses and one tractor are employed. During the six months January-April and November-December, the average weekly cost of upkeep amounted to £1 10s. 8d. per head, and during the six months May-October 17s. 5d. per head, or only 56 per cent. of the average winter cost. During the six winter months the horses were working, on the average, 3.6 days a week, or 66 per cent. of the number of days possible, at an average of 8s. 8d. per working day. During the summer months the horses were working, on the average, 2.8 days a week, or 51 per cent. of the number of days possible, at an average cost of 6s. 4d. per working day. The months when the horses were most fully employed were February, March and November, while August was the month of least employment. Horse labour was cheapest during May, when partly on summer rations they were working 71 per cent. of the days possible. In April, when on full winter rations, they were working only 47 per cent. of the days possible, the cost of horse labour amounted to no less than 11s. 9d. per working day.

(c) On the 16 farms whose accounts for the year 1920-1921 have already been completed, the cost of horse labour has been found to vary between the extreme limits of 4s. and 9s. 7d. per working day, with an average of 5s. 8d.

* Presidential address, British Association, 1921.

On Farm I, a small and well-managed farm of 86 acres, 45 of which are arable, two working horses are kept, or 4.5 horses per 100 acres of arable land. Each horse worked 255 days or 88 per cent. of the total possible. The yearly cost of upkeep per horse was £51 0s. 6d., and the average cost of horse labour was 4s. per working day. The grass-land on this farm had been limed, slagged and generally improved, and carried the equivalent of 1 horse to 1.12 acres. All the foods consumed were home-grown—good crops produced cheaply—and the total food bill amounted only to £32 5s. 6d. per head. The low cost of upkeep and the high percentage of days on which the horses were fully employed, resulted in cheap horse labour on this farm.

On Farm G the cost of horse labour per working day amounted to 9s. 7d. Here the grass-land had been badly neglected and carried the equivalent of one horse to 3.7 acres at a cost of £8 11s. 6d. The horses were well fed, each horse consuming, in addition to its grazing, 6 cwt. of roots, 35 cwt. of seeds hay, 15 cwt. of oat straw, 11 qr. of home-grown oats and 5 cwt. of purchased corn. The total food bill per horse amounted to £56 13s. 10d. The horses were bought at a high price, with a correspondingly high yearly depreciation, and the average yearly cost of upkeep per horse amounted to £89 15s. 2d. Four working horses and one tractor were kept on the farm which could not keep more than two teams busy, with the consequence that each horse was only employed on 187 days or 66 per cent. of the total possible. This resulted in dear horse labour; the farm was overstocked with horses; the grass-land was not carrying the stock it could have done under good management; and the horses were not kept fully employed and *were being heavily fed while doing little work.*

It is surprising to find how frequently the rations of farm horses fail in being adjusted to the work they are doing. On one farm where the horses were only working 1.2 days per week during July last they were receiving more than 10 lb. of oats per head per day in addition to their grazing, and with a weekly cost of upkeep of 17s. 6d. per head the horse labour was costing during that month 14s. 1d. per working day. Every farmer realises in a general way the importance of keeping his horses busy, but not all fully realise how largely the cost of horse labour influences the costs of cultivation and the costs of production of farm crops.

On Farm I where the horses worked 255 days last year, or 88 per cent. of the total number possible, at a cost of 4s. per working day, the cost of ploughing during the whole year

averaged 17s. 6d. per acre and the horse labour added £1 0s. 6d. per acre or 4s. 3d. per qr. to the cost of growing wheat.

On Farm G where the horses worked 187 days last year, or 66 per cent. of the total possible at a cost of 2s. 7d. per working day, the cost of ploughing during the whole year averaged £1 8s. 9d. per acre, as compared with 17s. 6d. per acre on Farm I, and the horse labour added 22 9s. 5d. per acre or 10s. 6d. per qr. to the cost of growing wheat.

* * * * *

SEED CONTROL, 1920-21.

THE results of last year's administration of the Testing of Seeds Order, 1918, are interesting from many points of view. In spite of the difficulties caused by the coal strike, occurring as it did during the busiest period of the seed trade, no fewer than 632 seed establishments were visited by the Ministry's Inspectors for the first time, and a large proportion of the 3,250 firms already called upon were revisited. The principal objects of these visits were to ascertain whether sellers of seeds were complying strictly with the requirements of the Order, and to draw control samples, where necessary, for the purpose of having check tests carried out at the Official Seed Testing Station. At the same time the opportunity was taken to acquaint seedsmen and farmers with the main provisions of the Seeds Act, 1920, which was passed to regulate the sale of seeds in the interests of British agriculture.

Control Samples.—The number of control samples, apart from packets of garden seeds, taken during the 1920-21 season, was 1,757, and included 364 samples of clover, 273 of grasses, 19 of field seeds, 25 of cereals, 432 of roots and 644 of vegetables. The check tests carried out at the Official Seed Testing Station showed that in 146 cases, or about 8 per cent. of the total number of samples taken, the declaration made by the seller was inaccurate in certain particulars. These discrepancies were mainly in respect of clover, grasses and field seeds; 15.9 per cent. of the total number of clover samples, 18.2 per cent. grass samples and 15.8 per cent. field seed samples proving to be inaccurately described. During the 1919-20 season, of the total number of 1,206 samples drawn, there were 109 cases (about 9 per cent.) in which the declaration made by the seller was not confirmed by the official test. Here again, as was also found

in the 1918-19 season, the discrepancies were mainly in the clover and grass samples.

The principal sources of error in the statements made by vendors of seeds during 1920-21 are given below, together with the corresponding figures for the previous season:—

1920-21.	<i>Corresponding figures 1919-20.</i>
(a) Number of cases in which the declared percentage as to germination differed from the figures ascertained on the official test—	
between 10 per cent. and 15 per cent.—27 ...	17
,, 15 ,, ,, 20 ,, —32 ...	5
over 20 per cent.—53	14
(b) Number of cases in which the difference in purity was from—	
3 per cent. to 5 per cent.—3	15
5 per cent. to 10 per cent.—2	6
Over 10 per cent.—1	4
(c) Number of cases in which the presence of Dodder was not declared—20	20
(d) Number of cases in which the percentage of injurious weed seeds was not correctly declared—7	32
(e) Number of cases in which the declaration was incomplete—7	5
(f) Number of cases in which no declaration at all was given—25	7

It will be observed that the number of cases in which the percentage figure of germination was radically wrong has increased by over 300 per cent. as compared with last year. Of the total number of cases in which the declared percentage of germination was at variance with the results ascertained on the tests, namely, 112, 69 related to clovers and grasses, and 41 to vegetable seeds. Of the former, trefoil showed the worst results, 18 cases being recorded of which 14 showed a difference in germination of over 20 per cent. Among the vegetable seeds parsnip was the worst offender, accounting for 12 cases of which 7 showed a difference of over 20 per cent.

As experience in the administration of the Testing of Seeds Order increased with each year's working, the Inspectors were careful to draw control samples only from bulks which they had reason to think were not up to the standard declared by the vendor. It is, therefore, a difficult matter to draw general con-

clusions from the results of the official analyses of these samples. The principal factors governing the germinative value of seeds are, of course, the condition in which seed is harvested and the conditions under which it is stored. From a series of observations carried out at the Official Seed Testing Station it was found that high-grade seed stored in good condition lost little of its germinative power in 12 months. As was to be expected, however, the fall in germination of seed of inferior quality, even when well stored, was more marked. In some of the cases in which inquiries were made, as a result of the test of a control sample, it was ascertained that the original test of the seed, before it was offered for sale, was carried out at the Official Seed Testing Station, and in one or two instances it was possible to conduct a series of re-tests of portions of the original sample and of the control sample. A few typical examples are given in the table below.

	<i>Date of test.</i>	<i>Germination, per cent.</i>	<i>Date of re- test of further portions of sample.</i>	<i>Germination, per cent.</i>
Sample No. 1 (Crested Dogtail)—				
Original sample sent to Station by wholesaler	Feb., 1921	88	July, 1921	83
Control sample taken from bulk	June, 1921	68	July, 1921	45
Sample No. 2 (American Timothy)—				
1st sample sent by wholesaler	Nov., 1920	96	July, 1921	95.3
2nd sample sent by wholesaler	Dec., 1920	94	July, 1921	95
Control sample taken from bulk stored by retailer	June, 1921	82	July, 1921	76
Sample No. 3 (Irish Italian Ryegrass)—				
Sample sent by whole- saler	Nov., 1920	89	June, 1921	86
Control sample taken from bulk	May, 1921	72	June, 1921	66

From these figures it will be seen that under the conditions of storage which exist at the Official Station, the portion of the original sample showed little loss in germination, whereas the results of the re-test of the control sample, which, it must be remembered, was taken from the bulk stored by the seller, indicated that the seed was deteriorating rapidly. While, therefore, the increase in the percentage number of cases in which the declared figure of germination was below the figure stated by the vendor may be attributed largely to the conditions pre-

vailing at last year's harvest, there is not much reason to doubt that if seedsmen gave greater consideration to the question of storage there would be fewer cases of abnormal fall in germination of seed offered for sale.

Another outstanding feature of the 1920-21 season was the increase in the number of cases reported to the Ministry in which seeds were offered for sale without the particulars as to purity, germination, etc., prescribed by the Order being stated. The majority of the vendors pleaded ignorance of the requirements of the Order, while others stated that samples of the seed were "in test." In all but a few cases, however, the results of the check tests showed that the seed offered for sale was of average quality. The omission to state the required particulars was pointed out to the offending firms, who were warned that if the circumstances were repeated the Ministry would not take so lenient a view of the matter. The fact that the number of cases reported to the Ministry under this head is more for the 1920-21 season than for the previous season cannot be regarded as an indication of a general laxity on the part of seedsmen to comply with the provisions of the Order, but is due more to increased vigilance on the part of the Ministry's Inspectors with a view to checking this form of evasion. As a general rule, the reports show that in almost all districts there was a desire to observe carefully the statutory requirements.

In almost every case where the attention of the vendor was called to the discrepancy between the particulars declared by him and those ascertained on the check tests, the action of the Ministry resulted either in the stocks of seed being destroyed, or in the seller adopting the official test as the basis of his statement in further sales.

It is satisfactory to record the great improvement in the purity of seeds, and the decline in the number of cases where the percentage of injurious weed seeds was incorrectly stated, as shown in the analyses of the control samples, especially as samples from suspected stocks only were drawn as a rule.

Points arising in the Administration of the Order.—*Prosecution.*—The only prosecution for an infringement of the provisions of the Order was heard in May, 1921, when legal proceedings were taken against a Welsh seed merchant on two informations:—

- (a) For exposing for sale seed oats without displaying a copy of the declaration required by the Order.
- (b) For failing to give the Official Sampler the particulars required by Clauses 1 and 2 of the Order in respect of samples taken.

On the first count the defendant was fined 20s. and 42s. costs, while the second charge was dismissed by the Court on the ground that the defendant had made a mistake in allowing a sack of feed oats to be sampled instead of seed oats.

Partial Failure of Wheat Crop.—The attention of the Ministry was drawn to the partial failure of a field of autumn-sown wheat in Devon. The failure was alleged to be due to seed of low germination, and it was ascertained that the firm from whom the farmer purchased the seed omitted to furnish the particulars required by the Order within one month of the delivery of the seed. On inquiry being made, however, it was found that a sample of the seed had been tested at the Official Seed Testing Station, and that the germination was shown to be reasonably high. The seed had been treated by the purchaser with a preparation for the prevention of smut, which was probably the cause of the partial failure of the crop.

Impurities of Red Trefolium —A sample of red trefolium was taken on the premises of a seedsman in Devon, the purity of which was being declared as 95 per cent. On a check test being carried out, it was found that the purity was only 77 per cent., the bulk of the impurities consisting of red clover. The evidence appeared to be sufficient to support proceedings for a breach of the Order, but as apparently the adulteration occurred through careless handling in the warehouse, and not through malicious intent, it was decided to do no more than send a strongly-worded letter of warning to the seedsman in question.

Case of Low Germination.—A sample of parsnip seed taken on the premises of a firm of ironmongers was found, on an official test, to germinate only 4 per cent. It was ascertained that the seed, together with other lots, was purchased by the vendors when taking over the business 12 months previously. On the matter being taken up with the firm, the parsnip seed was destroyed, and samples of the other seeds were sent for testing.

The Sale of Seeds in Small Packets.—During the season, 1,534 packets of seeds were drawn by the Ministry's Inspectors and sent to the Official Seed Testing Station for check tests to be carried out. The results of these tests showed that 80.4 per cent. of the packets contained seed germinating at or above the standards authorised by the Testing of Seeds Order, 13.2 per cent. were below the standard but above two-thirds, and 6.4 per cent. were below two-thirds of the standard. These figures, while indicating a slight improvement on the averages for the previous seasons, show that there are still in the country con-

siderable stocks of packets containing seed of low germination. Under the Order it was not obligatory on the part of a vendor of packeted seeds to declare any particulars where the seed was sold at or above the minimum standard of germination. Consequently, although the seed may have been of high germination when delivered by the wholesaler, the explanation of the existence of large quantities of low-grade packeted seed is probably due to unsold packets being held over by retailers from one year and offered for sale the next. It frequently happens that stocks of this nature are in the hands of local tradesmen with no particular knowledge of seeds, whose experience is limited to the comparatively small amount of trade done seasonally. Under the Seeds Regulations, 1921, which have been made by the Ministry in accordance with the Seeds Act, 1920, a seller of packeted seeds must, in future, either furnish the purchaser with the full particulars required in the case of the sale of the particular kind of seed in bulk, or he may avail himself of the special provisions made for the sale of seeds in packets, in which case he must state the season in which the seeds were packeted, as well as other particulars relating to purity, germination, etc.

The New Regulations.—The Testing of Seeds Order, 1918, was revoked on 1st August, 1921, the date on which the Seeds Act, 1920, and the Seeds Regulations, 1921, came into operation. The Order was the first Regulation of any kind in Great Britain which was framed to protect the farmer from knowingly sowing seeds of low germination or contaminated with noxious weed seeds. It is, of course, an unquestioned fact that the farmer must spend, in producing a crop, far more in labour and materials than the initial cost of the seed he sows, and any measure which tends to improve the quality of seeds offered for sale must therefore be of lasting benefit to agriculture. In administering the Order, the Ministry was more concerned to convince farmers and seedsmen of the value of a system of seed testing than to become a Public Prosecutor in cases of omission to comply with its requirements. The experience gained and the lessons learnt during the operation of the Order have proved invaluable in framing the Seeds Regulations, 1921, and while the Ministry will continue to regard the Seeds Act, 1920, as primarily an educational measure for the improvement of British agriculture, it will not hesitate to put the penal provisions into operation, in the interests both of the farmer and of the seed merchant himself, where there is any clear case of neglect to observe the seed law.

A UNIQUE COW CLUB.

THE following note has been communicated by Professor D. A. Gilchrist, Armstrong College, Newcastle-upon-Tyne :—

What is probably a unique Cow Club, managed by a community of miners, is continuing its successful career. This is the North Seaton Co-operative Farming Society, members of which recently visited Cockle Park with the objects of seeing how land for pasture and meadow hay can be improved and of obtaining information on the economical feeding of dairy cows. The Cow Club, as it was originally called, was founded in 1872, the colliery village having no milk supply. The members numbered forty or fifty miners, each of whom paid £1. They started with three cows, increasing the number as the demand for milk increased. After a time the Colliery Company built a brick cow byre to stall 14 cows and let to the Club two fields amounting to 24 acres, half being grazed and the other half mown for hay. A larger byre was built about 15 years ago to accommodate 22 cows, and the stock now usually includes 20 cows, one bull, and a pony. Milk is supplied to anyone in the village, members and non-members. The late Mr. G. B. Forster, who was managing owner of the Colliery Company in 1872, took a great interest in the foundation of the Society.

In 1914 the Society sold milk at 3d. a quart; in 1920 the price was 6d.; but while in 1914 the average cost of keeping each cow was £22 14s., in 1920 it was £70. In 1920 each cow produced over 800 gallons of milk. By showing in the balance sheet a nominal valuation of each cow (in 1920 it was £27), the Society protects itself against any sudden and heavy fall in prices that might occur. There are now 165 shareholders in the Society, which revised its rules some eight years ago and pays 5 per cent. on the share capital, the balance, after providing for a reserve fund, being paid to members as dividend on their milk purchases. As much as 4s. in the £ has been paid in this way. The management of the Society has evidently been on sound and economic lines throughout, enabling it to sell milk at reasonable prices and to build up ample financial reserves. The main object of the Society is to meet efficiently the milk needs of its members, not to make large profits; it has shown how a club having this object can be managed economically and successfully, and has demonstrated that the two essentials to success are, first, close attention to business principles, and, secondly, proper management of the cows.

PRUNE-GROWING IN SOUTH-WEST BEDFORDSHIRE.

N. J. Wood, B.A.,

Ministry of Agriculture.

THE prune-growing district in South-West Bedfordshire and in North Buckinghamshire occupies a belt of land about 14 miles long and 2 miles broad stretching from Stanbridge and Totternhoe in the east to Aylesbury and Wendover in the west. There are some 2,000 acres of fruit in the whole district, and in the smaller area in Bedfordshire and on the borders of the two counties about 500 acres are under prunes.

In the smaller area the soil is a fairly heavy clay, mixed with which is a large percentage of lime. This soil appears to suit the prune, and the need for lime is shown by the fact that in one orchard where prunes were planted on clay no success was obtained until the soil had been heavily limed, after which the trees made excellent growth. Many growers apply lime, which is conveniently obtained from the numerous lime-works near Dunstable. The under rock is almost pure limestone, which on the Dunstable Downs often comes to the surface.

Cultivation.—The prune orchards are all under grass and do not come into full bearing until the trees are about 30 years old. Most of the orchards were planted about 40 or 50 years ago, and are therefore now in their prime; it is said that the trees will continue bearing fruit until they are 100 years old. After planting no cultivation of the soil takes place; it is found that cultivation prevents fruiting, and once the tree is formed the orchards are allowed to run to grass and are used as poultry runs, or, later, as keep for cattle and pigs. Cow manure appears to be very beneficial to the trees.

In many of the smaller orchards the trees were planted unsystematically and little attention was paid to them in their early stages, so that they are now badly-shaped and weak-bearing. Where planted systematically, however, it has been found that the trees must be given plenty of room owing to their spreading habit and the size they attain. Thirty feet square is not too much if the trees are to have full advantage of light and air. The weak spreading habit of the tree often causes the branches to bend down to the ground with an abundant yield of fruit. Some growers have permanent props for the principal branches, and these undoubtedly prevent damage to the fruit.

Once the tree is formed no pruning is done except to cut out dead wood. Even this is often neglected, with the result that in many cases large main branches have had to be removed eventually, whereas a little judicious cutting a few seasons before would have prevented the spread of the diseased wood.

As a general rule, manuring is confined to the droppings of animals, but some growers apply farmyard manure or shoddy as a mulch round the trees; and as stated above a dressing of lime is often given.

Character of Tree.—The prune tree is always grown as a standard in this district and attains considerable size. The leaf is smaller than the ordinary plum leaf but larger than that of the damson. The fruit is very similar to the damson, but much larger, and a very fine "bloom" is a characteristic which distinguishes it in normal seasons. In taste it is bitter, but its keeping qualities are excellent, and for this reason a large quantity of the fruit is despatched for use in the Fleet. This appears to be one of its chief uses; another is that of making dyes for silken materials. So far as can be ascertained it is not used as a dessert fruit, but is largely used for culinary purposes, and owing to its lateness usually commands a good price.

Marketing.—A considerable quantity of the fruit goes to the markets in the great northern towns, but consignments are sent to all parts of the country. This season has been a very bad one; though the trees blossomed well, frost did a lot of damage before the fruit set, with the result that the crop has been practically a failure. A good season has not been experienced since 1918, when an average of about 6 tons to the acre was obtained; in 1919 about half this quantity was picked, but last year and this year only a few bushels have been gathered. A normal season yields 4-5 tons to the acre. The fruit is usually sent away in sieves and half-sieves, and as a general rule travels very well.

It is astonishing that this fine prune has not spread to other districts. There is a local belief that it does not grow well in Kent, but in all probability it has never had a fair trial. A certain number of suckers were sent to Wisbech and up to the present they are giving indications that they will do well, although their exploitable age has not been reached.

Pests.—The chief insect pest is the leaf-curling aphid which does very considerable damage in some years, a reduction of 20 per cent. in the crop resulting. Caterpillars of the lackey moth are sometimes troublesome, and a mite, which

causes galls upon the leaves and renders them unsightly, is sometimes found in the older orchards, but the damage done is not sufficient to result in appreciable loss of crop.

Silver Leaf has appeared in some orchards, but few trees have been killed or have had to be totally removed. The reason for this apparent resistance is probably the vigorous growth and natural hardiness of the prune; and the possible use of the prune as a stock for other plums, especially Victorias, is suggested as a method of combating the disease.

Very little spraying is done in the district, except in the best orchards. A home-made mixture containing copper sulphate and lead arsenate has proved very satisfactory. Some growers limewash their trees and occasionally spray with lime; but as a general rule, owing to the expense of the operation, the small orchards receive little or no treatment.

* * * * *

STORAGE OF APPLES.

IN the past the smaller commercial growers in this country have paid very little attention to the necessity of storing their apple crop under the best conditions. Even the larger growers, with a few exceptions, rush their produce on the market direct from the trees, and in the first place cause a glut, to the detriment of all concerned, and in the second place compel the consumption in early autumn of varieties which would command a much higher financial return if kept until January or February.

In other cases the storage accommodation is of such a crude and unsuitable description that it accelerates rather than retards the decay of the fruit. Apple rot has been very virulent this season (1921) and apples which might have been expected to keep for several months have rotted wholesale in three weeks. No doubt the climatic conditions have been abnormal, rendering make-shift stores useless, mainly owing to the difficulty in keeping down the temperature. On the other hand, birds have been in desperation for moisture and their attacks on apples have been more severe than ever before, thus compelling growers to pick earlier than the weather conditions necessitated.

Essential Conditions.—So far as modern research has carried us, the following conditions as to storage are deemed to be essential, although there are indications that these views may have to be changed in the future :—

(1) An equable temperature is necessary. This should be not higher than 45° F. and preferably lower, provided it does not fall below 32° F. The building should be of such construction as not to be readily affected by the sun's heat or fluctuations in the external atmospheric temperature.

(2) There should be sufficient ventilation to guard against a stagnant atmosphere, but our ideas regarding this may have to be modified in the light of modern research. Suffice it to say that a building used for a combined office or similar purpose as well as an apple store is most unsuitable, owing to the fact that it is being opened constantly for purposes other than the packing or removal of fruit.

(3) The atmosphere must not be dry.

(4) Darkness is preferable at all times, save when the store has to be entered. A cellar is therefore much more suitable for storing apples than a room at the top of a dwelling-house or a loft or granary.

The most successful fruit stores in the country are those which have been built 3-4 ft. below the ground level and lined with boards, roofed with lath, and covered with a thick thatch of heather or reeds. Some have been covered completely with heather or reeds and some have double walls of wood filled between with sawdust, which is a splendid non-conductor. In other cases the whole building has been excavated into a bank.

The store should face north, if possible, and have the entrance at the north end. Some protection by trees and the configuration of the ground against the sun is an advantage on the south and south-west. The interior should have an earthen floor, and be shelved around the sides, with a central tier, and a passage right around. As a rule it is best to store late-keeping varieties at the further end of the store, so that they are as little affected by removals as possible.

A Successful Fruit Store.—The following are particulars of an admirable fruit house for a small fruit holding which is in use in the Eastbourne district.

It consists of a thatched shed with shelves running all round and a tier down the centre. A path about 2 ft. 6 in. runs around the central tier of shelves. The idea of thatching both the roof and sides is to ensure an equable and non-fluctuating temperature, this being very necessary for fruit storage. Heather is the finest thing for thatching a shed of this description and such a thatch will last 20 years.



FIG. 1.—A Thatched Fruit Store in use on a Small Holding.



Photos.

[Reeves, Leves.]

FIG. 2.—Interior of Thatched Fruit Store, showing the arrangement of the shelves.

Again, the earthen floor is important. So many make the mistake of concreting the floor, which is bad both in hot and in cold weather. Another feature of great importance is the provision of side and end ventilation and *two* doors, the inner one being of fine gauze like a mosquito-proof door of the tropics. With the ventilator closed and the door blocked with a sheaf of straw, this store is frost-proof in the severest weather.

* * * * *

PROGRESS IN THE REDEMPTION OF TITHE RENTCHARGE.

PRIOR to the passing of the Tithe Act, 1918, the conditions under which tithe rentcharge was redeemable were by no means attractive to landowners. The amount payable in practically all cases was 25 times the original commuted figure, so that whether the value of £100 tithe rentcharge stood at £66 10s. 9½d., as it did in 1901, or at £109 3s. 11d., as it did in 1918, the landowner who wanted to redeem would have to pay £2,500. Moreover, where the tithe rentcharge exceeded 20s. the landowner could not redeem without the titheowner's consent, and if such a tithe rentcharge was attached to a benefice, the concurrence of the bishop of the diocese and patron of the living was also necessary.

With a view to encouraging redemption, the Tithe Act, 1918, dispensed, generally speaking, with the necessity for any consents by the titheowner, patron or the bishop, and provided that the consideration for redemption should be fixed by agreement between the landowner and the titheowner, or, in default of such agreement, by the determination of the Minister. No agreement is, however, valid:—

- (a) If made by a spiritual person entitled in respect of his benefice or cure, except with the consent of Queen Anne's Bounty; or
- (b) If made by a person (not being a spiritual person so entitled) who is not empowered to sell the rentcharge unless he obtains the consent of some other person, except with the consent of that other person.

Section 4 (1) of the Act directs that, in default of an agreement as to the amount of the consideration for redemption, the Minister, on the application of the owner of the rentcharge, or of the owner of the land or any part thereof, shall determine what is fair compensation for the redemption in accordance with the method prescribed in the First Schedule of the Act.

This Schedule provides that the Minister shall estimate the annual sum payable in perpetuity which he considers equal to the variable tithe rentcharge which would be payable if there were no redemption. This estimated annual sum is called the "gross annual value," and the following deductions are directed to be made from it in order to obtain what may conveniently be described as the "net annual value":—

- (1) The average annual amounts paid or payable by the titheowner in respect of the rentcharge on account of rates and land tax during the three years immediately preceding the date of the application to redeem; and
- (2) Such sum, not exceeding $2\frac{1}{2}$ per cent. of the "gross annual value," as in the opinion of the Minister represents the necessary cost of collection of the rentcharge.

The compensation for redemption is such sum as in the opinion of the Minister is sufficient, after payment of the cost of investment, to produce, when invested in Government securities, an annuity equal to the "net annual value."

In the case of an application for redemption made on or before the 1st January, 1921, the Schedule directs that the "gross annual value" of the rentcharge must be taken to be the original commuted amount thereof, and that the compensation must be twenty-one times the "net annual value" obtained from it as explained above.

At the end of the year, on the recommendation of a Departmental Committee consisting of Sir Charles Longmore, K.C.B. (Chairman), Sir Henry Rew, K.C.B., and Mr. W. R. Le Fanu, with Mr. P. W. Millard of the Ministry as Secretary, the Minister decided that, for the purpose of any redemption of tithe rentcharge for which application was made after the 1st January, 1921, until further notice, the gross annual value for the purposes of the Tithe Act, 1918, should be at the rate of £118 for each £100 of tithe rentcharge (commuted value) and the compensation for redemption should be seventeen times the "gross annual value" after the above-mentioned deductions therefrom had been made. The following is a typical calculation of the consideration money for the redemption on these terms of £100 tithe rentcharge. Assuming that:—

- (1) The rateable values of £100 tithe rentcharge (par value) for the past three years were £73, £68 and £63, and that the rates in the pound were 5s., 7s., and 9s. respectively;
- (2) The assessable values for the past three years for land tax purposes were £73, £68 and £63, respectively,

and that the land tax was at the rate of 3d. in the pound in each of the three years;

(3) The cost of collection was $2\frac{1}{2}$ per cent.;

(4) The case is one in which no remission or abatement in respect of rates was allowed to the titheowner;

the consideration money for redemption would be arrived at as follows:—

	£	s.	d.	£	s.	d.
Gross Annual Value...	118	0	0			
Deductions:—						
Rates on £73 at 5s. in the £ ...	18	5	0			
„ £68 „ 7s. in the £ ...	23	16	0			
„ £63 „ 9s. in the £ ...	28	7	0			
Average for 3 years, 1918-20 ...	23	9	4			
Land tax at 3d. in £; Average for 3 years, 1918-20, on £73, £68 and £63 respectively ...	0	17	0			
Cost of Collection, $2\frac{1}{2}$ % on £118...	2	19	0			
				27	5	4
Net Annual Value ...	£90	14	8			

The consideration money = £90 14s. 8d. $\times 17$ = £1,542 9s. 4d., i.e., approximately 15.42 years' purchase of the par value of the tithe rentcharge, and 14.12 years' purchase of its present value, viz., £109 3s. 11d.

It should be clearly understood that, owing to the wide variation in the relative amounts of local rates, land tax and cost of collection payable in respect of tithe rentcharge in different parishes and by different titheowners, the cost of redemption in any particular case may differ somewhat considerably from that shown in the above example. For instance, in the case of tithe rentcharge attached to a benefice, certain abatements in respect of rates are allowed to the titheowner. Consequently, in such a case, the deductions for rates would usually be less, and the amount of the consideration for redemption would be greater than in cases where the tithe rentcharge is owned by the Ecclesiastical Commissioners, a College or some other lay body or person. In cases completed on this year's basis for redemption, the calculation has worked out on an average at $17\frac{3}{4}$ years' purchase of the *par* value for tithe rentcharge attached to benefices, and $15\frac{1}{8}$ years' purchase for lay tithe rentcharge.

The Annual Report of Proceedings under the Tithe, &c., Acts, for the year 1920, recently issued by the Ministry,* states that the amount of tithe rentcharge included in compulsory applications in 1920 was approximately twice as much as in 1919 and four times as much as in 1913, and that the increase in the amount comprised in voluntary applications was much more noticeable, being nearly thirteen times the amount for 1919 and over 261 times the amount for 1913. It is also stated that the amount of tithe rentcharge included in voluntary applications received in 1920, rose from £2,396 in January to £151,243 in December, the amount for the latter month alone being double the total sum included in applications from the year 1846, when statutory provision was first made for the redemption of tithe rentcharge, up to the passing of the Tithe Act, 1918.

The number of letters received by the Ministry in 1920 in connection with business under the Tithe Acts, was approximately 65,000, while the letters sent out numbered 90,000. The number of orders, certificates, appointments of trustees and other formal instruments issued under the seal of the Minister in connection with this work, was about 15,600. The fees and charges paid to the Ministry during the year in connection with the work under the Tithe Acts were £14,818.

* * * * *

NOTES ON MANURES FOR DECEMBER.

E. J. RUSSELL, D.Sc., F.R.S.,

Director, Rothamsted Experimental Station.

Slag Phosphate.—A correspondent has raised the question as to what these words mean. They have been used in two senses. It has been not uncommon for agricultural experts and lecturers in speaking of basic slag to call the phosphate present therein "slag phosphate," to distinguish it from superphosphate; no doubt this use of the word will still continue owing to the difficulty of changing a common usage. During recent months, however, the words have been used to denote a mixture of basic slag and mineral phosphate which is now on the market. Farmers and others using the words "slag phosphate" must be careful to realise exactly in which of these two meanings they are intended.

* Obtainable from H.M. Stationery Office, Kingsway, London, W.C.2, price 9d. net.

Use of Superphosphate and Basic Slag on Arable Land.—

A correspondent has asked for an opinion on the following manurial scheme:—

<i>Super. per acre.</i>				<i>Super. per acre.</i>			
cwt.				cwt.			
Mangolds	...	8 to 10		Swedes...	...	6 to 8	
Wheat ...	...	none		Barley and seeds		3 to 4	
Oats ...	...	none		Two to three			
				years leys	...	none	

The rainfall is 40 in., the climate mild, the soil on the light side and the locality in the west country.

Superphosphate has so great a value as a fertiliser that it is a pity to use it for unsuitable purposes, as prejudice may thereby be created against it. There may be some sufficient reason for the dressing given to the mangolds, but so far as one can see it is probably unnecessary to give so much; in general 2 to 4 cwt. of superphosphate per acre is sufficient; indeed at Rothamsted the entire omission of superphosphate has not depressed the crop. There are a few special cases where larger dressings have been proved to be beneficial, and in the fen districts as much as 6 cwt. gave good results. The need for high dressings of superphosphate would seem to arise only when the plant has difficulty in starting or when very heavy dressings of dung are applied, *e.g.*, the 60 or 70 loads formerly used by some of the dairymen near London. In other cases the manuring for mangolds should rather be on the basis of:—

Up to 20 loads of dung.

1 cwt. nitrate of soda or sulphate of ammonia, 2 to 4 cwt. superphosphate or basic slag, 4 cwt. French or German kainit or 1 cwt. sulphate or muriate of potash, 2 to 4 cwt. salt in the drills.

1½ cwt. nitrate of soda as a top dressing when the plants are hoed and singled.

Naturally this recommendation must be modified to suit local soil and climatic conditions.

The swedes could quite well receive slag in place of superphosphate. This has not infrequently proved a useful substitute, and wherever finger-and-toe is prevalent slag should be preferred. In some centres, however, *e.g.*, at Newton Rigg and in the Devon experiments, superphosphate came out better, except where the soil was deficient in lime.

Barley following roots that have been folded can nearly always receive superphosphate with advantage; the straw is

strengthened and the quality of the grain improved. Leys will generally do better with slag than with other phosphates.

Lime and its various Forms.—Much confusion exists as to the forms in which lime is offered to the farmer. Among the various terms used are: lime, quicklime, ground lime, burnt lime, agricultural lime, limestone, pulverised or ground limestone, chalk, hydrate of lime, hydrated lime, etc. All of these serve as sources of lime, and under proper conditions all of them could equally be used for treatment of sour soil, whether of grass or of arable land. They differ very much, however, in the amount of true lime they contain; one product may be practically all pure lime, and another, even when free from any admixture or impurity, natural or artificial, contains at the best only 56 per cent. of pure lime. It is imperative that the farmer should know exactly what he is buying. All the various substances fall into 3 groups:—

Pure lime or calcium oxide,

Carbonate of lime, or calcium carbonate,

Hydrate of lime, or calcium hydroxide.

All consignments purchased at more than a few shillings per ton should be analysed and the results stated in terms of calcium oxide (CaO) which is a perfectly clear and unambiguous term, denoting pure lime. The following shows the relationships between them:—

1 cwt. (112 lb.) of calcium oxide (CaO) has same agricultural value as 1 cwt. 36 lb. of calcium hydroxide (Ca(OH)_2) or 1 cwt. 88 lb. of calcium carbonate (CaCO_3);

or, put in reverse order and in another way:—

100 lb. of calcium carbonate has the same agricultural value as 74 lb. of calcium hydroxide or 56 lb. of calcium oxide.

On this basis it should not prove difficult to compare quotations. The materials in common use are as follows:—

Calcium oxide (CaO): Burnt lime, ground lime, lump lime, cob lime. The composition varies according to the rock from which these are produced, but a good sample may contain about 85 per cent. calcium oxide (CaO), though higher figures are also obtained.

Calcium hydroxide or calcium hydrate (Ca(OH)_2): Hydrated lime, hydrate of lime. Composition depends on quality and nature of the rock. We have seen a sample made from the Somerset limestone which contained 96.6 per cent. of calcium hydrate, which as shown above has the same value as 73 per cent. of calcium oxide (CaO).

Calcium carbonate (CaCO_3): Limestone, ground limestone, chalk, ground shells, lime mud, chance mud, and other lime wastes from factories. Some of the English limestones are very pure, running up to 90 or even 95 per cent. of purity, 100 lb. having the same value as 50-53 lb. of calcium oxide (CaO). Fineness of grinding is an important consideration here. The waste limes naturally vary considerably.

Potassic Fertilisers and Crop Yields.—During the War farmers had to do without much potassic fertiliser and many of them suffered less than they expected. The idea arose in some cases that perhaps potassic fertilisers are not as necessary as had been thought. This, however, is not a correct deduction. The withholding of potash does not usually show immediately on the crop; it produces its effects later. The number of lb. of potash (K_2O) removed from an acre of ground are as follows:—

	<i>Yield per acre.</i>	<i>K₂O removed (lb.).</i>			<i>Equivalent to sulphate of potash— lb. per acre.</i>
		<i>In grain.</i>	<i>In straw.</i>	<i>Total.</i>	
Wheat	36 bush.	12	24	36	67
Barley	40 „	10	26	36	67
Oats	50 „	10	42	52	96
Clover hay	2 tons			84	155
Swedes	14 „	Roots only		64	119
Mangolds	30 „	„ „		300	555
Potatoes	12 „	Tubers only		153	283

Assuming that land is in fair condition to begin with a farmer might go through a war rotation without much risk, but if after that he has taken a potato crop he has probably fairly heavily depleted the store of potash in the soil. Lack of potash shows itself in a variety of ways, but when liberal nitrogenous manuring is given a common indication is a tendency to disease. Most good farmers are supplying nitrogenous fertiliser more liberally than they used to do. Before the War the total consumption in the United Kingdom of sulphate of ammonia and nitrate of soda used to be 140,000 tons per annum; in 1920 it was 237,000 tons. If farmers simultaneously reduce the consumption of potassic fertilisers they run the risk of inducing undesirable effects such as lack of vigour in their crops. This point has been definitely tested with a glasshouse crop. Dr. W. F. Bewley showed at the Cheshunt Experimental Station that the number of tomato plants affected by the “stripe disease” was, out of a total of 120 in each plot:—

<i>Variety.</i>	<i>Complete fertiliser.</i>	<i>No potassic fertiliser.</i>
Comet	40	78
Kondine Red.	13	33

Cases have this year been brought to the writer's notice of crops unexpectedly doing less well than might have been expected in spite of the drought; *e.g.* of corn after potatoes, of mangolds after mangolds, and the fact that the first-named crop in each case is a potash depleter suggests that a remedy might be in the use of potassic fertilisers.

* * * * *

NOTES ON FEEDING STUFFS FOR DECEMBER.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),
Ministry of Agriculture and Fisheries.

Feeding Wheat to Stock.—Several correspondents have written to ask that, in view of the fall in price, wheat should be included in the list of feeding stuffs dealt with in the following table. It has therefore been included, and it will be seen that the price has reached a stage where it is as economical to the farmer to feed the wheat to stock as to market it for flour. It is also interesting to note that at the prices recorded in the table, both bran and middlings are more expensive to feed than wheat itself. The points to be observed in feeding wheat are familiar to most stock feeders, but it will perhaps do no harm to repeat them. (1) Wheat should be ground for all stock except sheep, since the kernels are small and hard. (2) Wheat so ground should be ground only to a very coarse meal. If ground to a fine meal, the meal pastes in the mouth and forms an unsatisfactory feeding stuff. (3) Wheat should only form a small proportion of the concentrates fed to stock, except perhaps in the case of the pig. With the horse, feeding wheat in any quantity leads to digestive disturbances and skin eruptions.

Farm Values of Feeding Stuffs.—It is very convenient for the farmer to obtain some idea of the value per ton of the home-grown feeding stuffs as compared with purchased feeding stuffs, and several correspondents have asked that hay and oat straw should be included. An attempt has been made to do this, taking for comparison in the case of hay and straw, dried grains, and in the case of oat and vetch silage, the average

DESCRIPTION.	Price per Qr.		Price per Ton.	Manurial Value per Ton.	Cost of Food Value per Ton.	Starch Equiv. per 100 lb.	Price per Unit. Starch Equiv.	Price per lb. starch Equiv.
	s.	lb.	£ s.	£ s.	£ s.		s.	d.
Wheat, British - -	49/-	504	10 18	1 17	9 1	71 6	2/6	1/34
Barley, English Feeding	36/3	400	10 3	1 6	8 17	71	2/6	1/34
" Canadian "	33 6	400	9 8	1 6	8 2	71	2/3	1/20
Oats, English White "	29/6	336	9 17	1 9	8 8	59 5	2/10	1/52
" " Black & Grey	27/-	336	9 0	1 9	7 11	59 5	2/6	1/34
" Argentine - -	27/6	320	9 12	1 9	8 3	59 5	2/9	1/47
Maize, " - -	31/6	480	7 7	1 5	6 2	81	1/6	0/89
Rye, English - -	40/-	504	8 18	1 8	7 10	72	2/1	1/12
Millers' offals—Bran -	—	—	8 5	2 10	5 15	45	2/7	1/38
" " Coarse middlings -	—	—	11 5	2 10	8 15	64	2/9	1/47
Barley meal - - -	—	—	14 0	1 6	12 14	71	3/7	1/92
Maize " - - -	—	—	8 10	1 5	7 5	81	1/9	0/94
Fish " - - -	—	—	16 10	7 12	8 18	53	3/4	1/78
Linseed " - - -	—	—	17 10	2 16	14 14	119	2/6	1/34
" " Cake, English (9 ⁵ / ₁₆ oil) -	—	—	12 12	3 12	9 0	74	2/5	1/29
Cottonseed " " English (5 ⁵ / ₁₆ oil) -	—	—	8 15	3 5	5 10	42	2/7	1/38
" " " Egyptian (5 ⁵ / ₁₆ oil) -	—	—	8 10	3 5	5 5	42	2/6	1/34
" " " dross i-cated (7 ⁷ / ₁₆ oil) -	—	—	14 0 ¹	5 6	8 14	71	2/5	1/29
Coconut cake (7 ⁷ / ₁₆ oil) -	—	—	10 15	3 0	7 15	79	1/11	1/03
Palm kernel cake (6 ⁵ / ₁₆ oil) -	—	—	7 10	2 1	5 9	75	1/5	0/76
Brewers' grains, dried, ale -	—	—	10 0	2 7	7 13	49	3/1	1/65
" " " porter -	—	—	9 0	2 7	6 13	49	2/9	1/47
" " " wet, ale -	—	—	2 5	0 12	1 13	15	2/2	1/16
" " " wet, porter -	—	—	2 0	0 12	1 8	15	1/10	0/98
Malt culms - - -	—	—	7 0	3 6	3 14	43	1/9	0/94
Potatoes † - - -	—	—	1 15	0 8	1 7	18	1/6	0/80
Sweetes † - - -	—	—	0 15	0 5	0 10	7	1/6	0/80
Mangolds † - - -	—	—	0 15	0 6	0 9	6	1/6	0/80
Vetch and Oat Silage †	—	—	2 6	0 15	1 11	14	2/3	0/84
Good Meadow Hay †	—	—	6 10	1 14	4 16	31	3/1	1/65
Oat Straw † - -	—	—	2 19	0 17	2 2	17	2/6	1/34
Good Clover Hay †	—	—	7 1	2 2	4 19	32	3/1	1/65

* Price at Liverpool.

† Farm value.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose palm kernel cake is offered locally at £10 per ton. Its manurial value is £2 1s. per ton. The food value per ton is therefore £7 19s. per ton. Dividing this figure by 75, the starch equivalent of palm kernel cake as given in the table, the cost per unit of starch equivalent is 2s. 1d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.11d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.

of a fibrous food such as dried grains and a starchy food such as maize. It is desired to emphasise here that scientific accuracy is not aimed at in this assessment of values, but it is felt that the figures given per ton give the farmer a rough approximation of the value of his home-grown products. The figure is used in this way. As shown in the table, with maize at £7 7s. per ton, the farm value of potatoes is £1 15s. If, therefore, a farmer has potatoes which he can market at, say, £4 per ton, and the transport and marketing costs of selling the potatoes per ton and of delivering the maize to the farmer come to less than £2 5s., it clearly pays him to sell his potatoes and buy in maize at £7 7s. per ton for feeding. Similarly, with brewers' grains at £10 per ton, the farm value of good clover hay is £7 1s. per ton. It will therefore not pay a farmer to sell clover hay and buy in dried brewers' grains, unless the price realised at market, deducting marketing expenses and cost of delivery of the brewers' grains, comes to more than £7 1s. per ton of clover hay sold.

* * * * *

CONCILIATION COMMITTEES IN AGRICULTURE.*

THE whole of England and Wales is now covered by Conciliation Committees which have been set up under the Corn Production Acts (Repeal) Act, 1921, to deal with questions of wages and hours and conditions of employment of workers in agriculture. In certain cases the representatives of local employers and workers have arranged the formation of separate Committees for parts of the areas formerly covered by single District Wages Committees, with the result that there are now 56 Conciliation Committees as compared with the 39 District Wages Committees under the Wages Board system.

In four areas the Conciliation Committees have submitted their recommendations to the Minister for confirmation and the necessary steps have been taken, in accordance with the power vested in the Minister under the Act, to confirm the Committees' agreements. The details of the agreements so confirmed are as follows :—

- (1) *Cambridgeshire*.—A wage rate of 37s. 6d. for a week of 50 hours (excluding Sunday) shall be paid during the period from 22nd October to the 2nd December, 1921, for all able-bodied men of 21 years of age and over.

* This note explains the position as it existed on 21st November, 1921.

(2) *Surrey*.—(a) A wage rate for carters, cowmen and shepherds between the ages of 21 and 65 of 47s. 6d. for a maximum week of 60 hours (including Sunday) and a less weekly rate at the same rate per hour for a maximum week of less than 60 hours; all time in excess of 60 hours per week (including Sunday) to be paid at the rate of time and a quarter after the 60 hours have been worked.

(b) A rate for all male workers employed in agriculture between the ages of 21 and 65, other than those specified in clause (a) above, of 38s. per week of 48 hours (excluding Sunday); all time in excess of 48 hours per week (excluding Sunday) to be paid for at the rate of 11d. per hour, and all employment on a Sunday to be payable at the rate of 1s. per hour.

(c) All the rates specified to apply only to workers whose employment is terminable by a week or longer notice, and to operate from the 1st November to the 31st January, 1922.

(3) *Denbigh and Flint*.—During the period from 19th November to the 31st December, 1921, the wages payable to all male workers of 21 years of age and over employed in agriculture shall be not less than 37s. 6d. for a week of 50 hours (excluding Sunday); all time in excess of 50 hours per week (excluding Sunday) to be paid for at the rate of 10d. per hour, and all employment on a Sunday to be payable at the rate of 1s. per hour.

(4) *Isle of Ely*.—During the period from the 12th November to the 14th January, 1922, no male worker employed in agriculture shall be paid wages at less than the following rates:—

(a) *Male Workers aged 18 and over employed as Horsemen or Milkmen.*

Years of age.

21 and over	45s. 6d.	} For a week comprising the hours necessary for the performance of the customary duties of these classes of workers.
20 and under 21	42s. 6d.	
19 " " 20	40s. 0d.	
18 " " 19	38s. 6d.	

(b) *All other male workers employed in agriculture.*

<i>Ages.</i>		<i>Weekly Wages for a week of 48 hours.</i>	<i>Overtime rates for all time in excess of 48 hours per week.</i>
21 and over	...	33s. 0d.	10d.
20 and under 21	...	33s. 6d.	9½d.
19 " " 20	...	31s. 6d.	9d.
18 " " 19	...	30s. 0d.	8½d.
17 " " 18	...	24s. 0d.	6½d.
16 " " 17	...	19s. 0d.	5½d.
15 " " 16	...	15s. 6d.	5d.
14 " " 15	...	12s. 0d.	3½d.
Under 14	...	8s. 6d.	2½d.

While no definite agreement is made regarding Saturday half-day, the employers will not put any obstacles in the way of farmers arranging with their workmen for a Saturday half-day after 48 hours have been worked and this Clause is to be carried out in a reasonable spirit.

It should be borne in mind that these rates have been confirmed on the application of the Committees for the areas concerned. For the period of the operation of a confirmed agreement the rates specified in the agreement form an implied term of the contract of employment of every worker of the class in the particular area to which the agreement applies.

Agreements have also been reached by the Conciliation Committees in 30 additional areas, but the Committees in these cases have not made application to the Minister for confirmation of the agreements. In 7 of these areas the agreements having been made for a comparatively short period have already lapsed. Particulars of the current agreements relating to adult male workers in the remaining 23 areas are given below:—

<i>Area.</i>	<i>Period.</i>	<i>Wages.</i>	<i>Hours per week.</i>
1. Cheshire	Up to 31st Dec. ...	40/6	54
2. Cornwall	" 31st " ...	42/-	52
3. Cumberland and Westmorland	" 2nd Feb., 1922 {	37/6 50/-*	48 63
4. Devon	" 3rd Dec. ...	36/-	50
5. Dorset	" 31st " ...	36/-	48 With Saturday half-holiday.
6. Durham	" 1st Mar., 1922	44/6	50
7. Hertfordshire	" 31st Dec. ... {	38/- 41/-	48 52
8. Kent	" 31st " ...	38/-	50
9. Leicestershire Bosworth and Ashby	" 31st " ...	38/-	50
10. Market Harborough and Lutterworth	" 31st " ...	36/-	50
11. Norfolk	" 31st " ...	36/-†	48
12. Northants	" 31st " ...	36/6	48
13. Oxford	" 31st " ...	33/-	48
14. Shropshire	" 31st " ...	9½d. per hour up to 60 hours with guar- anteed week of 48 hours.	48
15. Soke of Peterborough	" 30th Nov. ... {	37/- 42/- 44/-	†Cottage { Not †Cottage { defined †
16. Somerset	{ " 25th " ... 38/- From 25th Nov. to 31st Dec....	36/-	50
17. Staffordshire	Up to 29th Jan., 1922	9½d. per hour for a mini- mum week of 50 hours.	50
18. Warwick	Up to 1st Dec. and until further notice	36/-	48
19. Worcester	Up to 1st Mar., 1922	36/-	48
20. Yorkshire (East Riding)	" 26th Nov. ...	39/-	7 a.m. to 5 p.m. each weekday with Sat- urday half-holiday

21. Yorkshire	Up to 30th Nov. ...	40/-	50
(North Riding)			
22. Brecon and Radnor...	„ 30th „ ...	38/-	50
23. Carnarvon	„ 5th Mar., 1922 {	35/-	48
		38/-§	60
	From 6th Mar. to 13th {	35/-	50
	May, 1922 {	38/-§	61

* These rates refer to "skilled" workers.

† Additional 7/- per week for workers employed wholly or mainly as teamsmen, cowmen or shepherds. Additional 5/- per week for workers employed wholly or mainly as sheep-tenders or bullock-tenders.

‡ These rates refer to horse-keepers and stock-keepers respectively.

§ These rates refer to special classes workers.

Although there are several areas in which the Conciliation Committees have not yet settled the wages question, further meetings are taking place daily and it is anticipated that these Committees will before very long find means to solve their local difficulties and reach a basis of agreement as to appropriate rates of wages.

* * * * *

THE Ministry desires to announce that a sum of money has been placed at its disposal for carrying out land drainage schemes primarily for the alleviation of unemployment.

Land Drainage as a Means of Alleviating Unemployment.

The bodies to whom advances will be made for this purpose are (a) Drainage Authorities, and (b) County Agricultural Committees. Those mentioned in the second category are intended only to deal with those portions of the country where no Drainage Authority has been set up. The scheme is shortly described below.

The Ministry will, if its technical officers are in a position to approve the schemes submitted, be prepared to advance all the money required in each case, subject to the following conditions:—

- (a) That all work shall be done as much as possible by hand labour.
- (b) That 75 per cent. of the labour shall be ex-service men, if available.
- (c) That, of the remaining 25 per cent., the majority shall be married civilians, if available.
- (d) That the wages payable for ordinary labour shall not exceed the Agricultural rates for the district as fixed by Conciliation Committees or otherwise, and
- (e) That at least 35 per cent. of the money advanced will be refunded to the Ministry.

The Ministry, in addition, reserves the right to inspect the works from time to time, to supervise the operations generally, and to call for progress reports when required.

The main object to be achieved is to get men rapidly on to suitable work, and the Ministry does not intend therefore to let any unnecessary formalities stand in the way of schemes that can be put in operation promptly.

It is hoped that all the Authorities concerned will co-operate cordially in making the above proposals a success and in getting as many men at work as possible, and thus at the same time improving the drainage of the country, on as large a scale as possible.

There is much land in England and Wales which suffers from permanent water-logging, or too frequent flooding, and the above proposals will, it is hoped, result in much additional land being brought into a more productive state than it is in at present.

* * * * *

HORTICULTURISTS and fruit-growers will notice with satisfaction that a new Horticultural Council has been established on a representative

**Horticultural
Advisory
Council.**

basis to advise the Ministry on all questions connected with the promotion of market-gardening, fruit-growing, flower-growing, and horticulture generally, including bee-keeping. In particular it is the function of the new Council to advise regarding the proper distribution of produce and the organisation of allied trades. It consists of about 40 members, one-fourth of whom are either representatives, or nominees, of the Ministry. The remaining members are nominated by various Associations, among which and representing the growers are the National Farmers Union, the Federation of British Growers, the Horticultural Trades Association, the National Union of Allotment Holders, the Royal Horticultural Society, and the Lee Valley Growers Association. The present nominees of these bodies include such well-known authorities as Mr. R. R. Robbins, C.B.E., Mr. F. Glenny, Mr. W. P. Seabrook, Mr. E. A. Bunyard, Mr. A. G. Jackman and Mr. F. J. Chittenden. Labour in Horticulture is represented by nominees of the Workers' Union and the National Union of Agricultural Workers, respectively. The wholesale Trade is represented by nominees of the National Federation of Fruit and Potato Trades' Association, and these include Major E. G. Monro and Mr. Geo. Swift. The Retail

Trade is represented by nominees of the National Federation of Retail Fruiterers, etc., Ltd., and these include Mr. M. Cowley and Mr. E. L. Vinden. The Fruiterers Company is represented by Mr. F. R. Ridley, and the Fruit Preserve Manufacturers, the Cider Industry and the Florists, are also represented, whilst the Chamber of Horticulture sends three representatives, including Mr. J. Rochford and Mr. C. E. Pearson. The Secretary of the Council is Mr. J. L. Bryan, M.B.E., of the Ministry of Agriculture and Fisheries, to whom all communications relating to the business of the Council should be addressed.

The Minister of Agriculture and Fisheries, in establishing the new Council and opening its first meeting recently, wished it every success and drew attention to several matters of importance to which it could usefully direct its attention.

* * * * *

In view of the importance of the potato crop and the need which still exists in most parts of the country for more information on all matters pertaining to potato

**Potato Growing:
Demonstration
Plots, 1922.**

culture, the Ministry considers that it is very desirable that the scheme of potato trial plots which has been carried out during the past two years by County Education Authorities should be continued in 1922. In previous years the main objects of the trials have been to demonstrate the cropping qualities of the newer varieties of potatoes immune to Wart Disease, and to prove the value of an adequate system of manuring. The trials for 1922 also have these two objects, and further, are intended to demonstrate the value of planting good seed from which all diseased and weakly tubers have been removed.

The varieties chosen for demonstration are:—*First earlies*: Immune Ashleaf and Dargill Early. *Second earlies*: Ally, Great Scot and Arran Comrade. *Maincrop*: Kerr's Pink, Majestic, Tinwald Perfection, Bishop, Irish Chieftain and Rhoderick Dhu.

Supply of Seed.—In order to demonstrate to the public the advantages to be gained by the use of reliable, healthy and immature seed, the Ministry made arrangements in the 1921 season, whereby special crops of the above varieties were grown in the same locality in East Ross-shire—a district far north, free from Wart Disease, where potato blight is seldom severe, and leaf curl is rarely known. Whilst growing, the crops were "rogued" and all weakly plants and those affected with leaf

curl or mosaic were removed under the supervision of one of the Ministry's experts. It is believed that the resulting seed is pure and healthy.

In cases where seed potatoes have been saved from the Ministry's trials in 1921, it is suggested that some be planted in 1922, so that trials can be made in order to compare the cropping qualities of this "once grown" English seed with those of seed of the same varieties direct from Scotland. The conditions under which both trials are made should, so far as possible, be uniform. If seed is saved from both crops in 1922, it should be possible in 1923 to carry the comparison still further and to compare the cropping qualities of Scottish seed with those of English "once grown" and English "twice grown" seed.

Quantity of Seed.—It appears generally convenient in these trials to use 28 lb. of each variety, and Authorities are asked not to make any alteration except for some special reason.

Manures.—The manurial treatment recommended for potatoes is that the land should receive a dressing of farmyard manure at the rate of about 15 tons per acre, applied in autumn, or, in the Northern districts, in the drills at the time of planting. Artificial manures should also be applied on dates to be recorded, in quantities somewhat as follows:—

Superphosphate (30 per cent.)	...	...	4 cwt. per acre.
Sulphate of Ammonia	...	...	1 " " "
Sulphate of Potash (50 per cent. Potash)	...	...	1 " " "

It is hoped that the trials will be carried out on uniform lines, since any deviation in manuring would somewhat influence the results; Authorities are therefore asked to adhere as closely as possible to the conditions set out.

Planting.—The time of planting will vary slightly according to the district, the usual time of planting in the district being adopted. It is further suggested that a distance of 30 in. between the drills, and 12 in. between the sets, should be maintained throughout all the trials. Any departure from these distances should be noted in the records of the trials.

* * * * *

DURING the early part of the autumn of 1920, the demands for phosphate for agricultural purposes appeared to be far in excess of the supply, and there was a prospect that this serious shortage would continue. The position, however, rapidly changed in January, February and March, 1921, and during the spring large quantities of phosphate con-

**Superphosphate :
Plentiful Supplies
Available.**

tinued to arrive. At the present time there is no question that all the superphosphate required for agriculture for the autumn and spring seasons of 1921-22 will be forthcoming, and at very much lower prices than have been possible hitherto.

Superphosphate is now on sale throughout the United Kingdom at about 3s. 3d. per unit of water soluble phosphate, a price which is based on the current cost of importing the raw materials required for its manufacture. In making this important reduction in price, the manufacturers are bearing a heavy loss on the large stocks of raw materials which were imported prior to the recent fall in freight rates, and are still held by them.

It is well known that superphosphates as such, and as contained in compound fertilisers, stand alone in providing a form of "water soluble" phosphate which confers certain special benefits on the young crop, unobtainable from phosphates in any other form. Water soluble phosphate dissolves in the first rain, percolating through the soil and becomes precipitated in extremely fine particles where the earliest roots of the crop are or will be penetrating. In this condition it has a most valuable stimulating effect on root development, especially for shallow-rooted crops like swedes, turnips and kindred fallow crops, and barley, and it has been the experience of farmers that nothing assists the establishment of a crop so much as a small amount of superphosphate with or near the seed. Superphosphate is thus particularly associated with arable farming.

It should not be assumed that the water soluble content of superphosphate and of compound fertiliser, forms the total phosphate which the materials contain. In the case of superphosphate, 30 per cent. water soluble, there is in addition about 2 per cent. other phosphates that are not counted in reckoning the price per unit, which is based only on the water soluble phosphate. With compound fertilisers, the total phosphate content is brought into account, the water soluble content being charged at about 4s. per unit, citric soluble phosphate at 3s. per unit, and insoluble phosphate (so-called) at 2s. per unit.

* * * * *

RECENT inquiries made by the Ministry in the markets of London, Birmingham and various provincial towns show that the methods generally adopted in the marketing of poultry and eggs are very unsatisfactory. The reason appears to be the absence of proper organisation and of correct marketing

The Marketing of Poultry and Eggs.

methods on the part of many amateurs engaged in poultry production. Salesmen complain of irregular supplies, and although this is natural enough in some respects owing to variations in seasonal production, the fact remains that there is often a glut in one market and a shortage in another through the lack of organisation and co-operation on the part of the producers. Complaints are frequently heard of carelessness, and even of sharp practice, in the marketing of eggs and poultry, and it is not surprising that English eggs in particular have sometimes a poor reputation on English wholesale markets. The Ministry considers that the position can be remedied to a large degree.

With regard to poultry, those producers of table poultry who regard this branch of work as of secondary consideration to the production of laying pullets, should not be dilatory in marketing their surplus cockerels. If no attention is paid to these birds they may be in poor condition when they are marketed. A few weeks lost in the earlier part of the table poultry season when supplies are scarce, mean that the best market has been missed, that the birds may arrive in inferior condition because they have been poorly fed, and at a time when there is a glut of poultry. In consequence the financial returns suffer to a treble extent. The farmer is often the worst offender in this direction. It often happens that he does not market the birds until they are comparatively old and tough. The salesmen are sometimes blamed for this, but it is clearly not their fault. It may happen in some cases that in consequence of a glut during hot weather, some of the dead poultry may become unfit for food and therefore unsaleable.

The producer of English table poultry should always bear in mind the competition with the improving classes of imported poultry. Even though he may be producing only second-grade poultry, properly marketed they will successfully compete with the best imported produce. At the present time it is not uncommon to find buyers showing a preference for imported produce over good English poultry on the wholesale market, the reason being that the imported birds are known to be of a reliable and uniform quality. The English producer should therefore breed birds of a type which will fatten economically and produce the kind of flesh the market requires. If marketed dead the birds should be prepared in such a way as to ensure their reaching the market in the freshest condition and in the way which is most acceptable to buyers.

With regard to eggs, gluts on the market are not avoidable, though they can be mitigated by the producer arranging that his hens come into lay at the time of year when eggs are scarcest. Eggs frequently give indifferent returns because they are not properly graded and packed, and the buyer is not satisfied that they are of reliable quality. Carelessness in collecting and storing, delay in marketing, and the holding back of eggs in prospect of a rise in price, are among the reasons why eggs of doubtful quality are sent to the salesmen. Clearly, the buyer cannot risk his reputation by passing them on as eggs of a reliable standard. He requires regular consignments of first-grade eggs, to which he can apply an accurate label of high quality. The competition from imported eggs is much greater than in the case of poultry, and it is actually the position now that eggs from the Continent are at present more reliable for sale as new-laid than some consignments of English eggs. This can be remedied by prompt and business-like methods on the part of our producers, and the marketing of their eggs through co-operative societies which will attend to regular collecting, proper grading, packing and marketing.

* * * * *

THE Ministry recently issued to Local Agricultural Educational Authorities the outline of the scheme for the distribution of

**Egg and Chick
Distribution
Scheme.**

hatching eggs and newly-hatched chicks among small-holders, cottagers, and other small poultry-keepers in rural districts. For this purpose, breeders have been selected by the Local Authorities and approved by the Ministry, and arrangements made for them to supply eggs and chicks to small poultry-keepers at somewhat lower than the usual prices charged. The approved breeders are to be known as station-holders. They are required to provide and maintain for station purposes at least 36 hens, or 24 hens and 12 ducks, of a breed or breeds to be approved by the Agricultural Education Committees. Other conditions are imposed, and it is desirable that all station arrangements should be completed before 15th December next. The County Committee will fix the prices at which the eggs or chickens, or both, may be distributed, and generally supervise the whole scheme.

Satisfactory reports have been received by the Ministry from County Committees on the working of the scheme during 1921.

The following are the numbers of eggs, chickens, etc., distributed in 1919, 1920 and 1921 :—

		<i>Hen Eggs.</i>	<i>Duck Eggs.</i>	<i>Chickens.</i>	<i>Ducklings.</i>
1919	...	52,980	—	2,974	—
1920	...	141,611	—	20,934	—
1921	...	104,304	1,464	37,661	222

The importance of this matter will be realised when it is stated that the estimated value of poultry produce imported into Great Britain last year was approximately £36,000,000. The scope which is therefore available for the extension of home production is very great indeed, even if taken at no more than the present rate of consumption. The scheme is designed to afford an opportunity to the small poultry-keeper to improve the productive quality of his stock.

After the scheme has been adopted by any County Committee, its successful working will depend almost entirely upon the degree of care and attention given to it by the county poultry instructor, the careful selection of the station-holders, and the maintenance of robust stock of good economic strain at the stations.

The county poultry instructor will select and mark those birds at each station from which eggs and chicks are to be distributed during next season under the scheme. He will see that no breeding stock of inferior quality is maintained at any station recognised under the scheme, and that the housing and general management of the station stock are of a satisfactory nature.

Those who wish to participate in the scheme should make early application to the county authorities. They will be charged from 5s. to 7s. per dozen for eggs and from 10s. to 14s. per dozen for chickens or ducklings.

* * * * *

An experiment is to be carried out at Send Manor Poultry Farm, Ripley, Surrey, under the direction of the Scientific

**Artificial Light
and Winter Egg
Production.**

Poultry Breeders Association with the object of ascertaining by means of two absolutely similar flocks of birds what advantage is obtainable as regards cost of production, number and size of eggs, during the winter months, by use of artificial light. A similar experiment is also to be carried out at the Harper Adams Agricultural College, Newport, Salop, under the direction of the College Authorities.

* * * * *

THE Treasury, on the recommendation of the Development Commissioners, have approved grants in aid of research and advisory work to be carried out in the academic year, 1st October, 1921, to 30th September, 1922, as shown in the statement below. Provision is made, in addition to the grants shown hereunder against the respective institutes, for the payment of a cost of living bonus to the graded workers at the institutes, but in general no new staff, promotions or development of work have been sanctioned. Proposals for development under these heads must await the allocation of the sum of £850,000 available under the Corn Production Acts (Repeal) Act, 1921, for the promotion of agricultural development in England and Wales.

**Grants in Aid
of Research and
Advisory Work.***

<i>Institution.</i>	<i>Grant (excluding Bonus).</i>	
	<i>Research Work.</i>	<i>Advisory Work.</i>
	£	£
Aberystwyth, University College ...	4,690	1,090
Armstrong College	—	1,530
Bangor, University College	—	2,590
Birmingham University	760	—
Bristol University	8,550	1,730
Cambridge University	—	1,630
Animal Nutrition	7,200	—
Plant Breeding	4,200	—
Small Animal Breeding	1,100	—
Bees... ..	500*	—
East Malting Horticultural Station ...	4,200	—
Harper Adams Agricultural College ...	—	580
Imperial College	3,600	—
Leeds University	—	2,000
London School of Tropical Medicine ...	1,300	—
Manchester University	—	1,000
Midland Agricultural College	—	1,150
Oxford University	4,640	—
Reading, University College	6,100	1,280
Rothamsted—		
Plant Nutrition	13,250	—
Plant Pathology	5,000	—
Royal Veterinary College	2,050	—
Waltham Cross Horticultural Station ...	1,000	—
Wye, South Eastern Agricultural College	—	3,170
	<u>£68,140</u>	<u>£17,750</u>

* A complete list of research stations with the subjects of research undertaken at each, and of advisory officers attached to university departments of agriculture and agricultural colleges, will be found in Leaflet No. 279, obtainable from the offices of the Ministry, 10, Whitehall Place, London, S.W.1.

THE Minister of Agriculture has appointed an Advisory Committee to assist the Ministry in deciding as to the general conditions which should govern the admission of agricultural machinery for tests under the auspices of the Ministry, and the principles which should be laid down as regards the duration and conditions of the tests.

**Testing of
Agricultural
Machinery.**

The Advisory Committee will also be asked to advise upon (a) the different categories into which agricultural machinery should be divided for the purpose of testing; (b) the nature of any diploma or certificate to be awarded, having regard to the recommendations of the report of the Departmental Committee on Agricultural Machinery (Cmd. 506); (c) the scale of fees which should be charged, and the date from which it would be possible to charge such fees; (d) the constitution of panels from which the Ministry might select Boards to be charged with the duty of drawing up and revising from time to time detailed conditions applicable to the machines of the various categories; and (e) generally upon the arrangements to be made for the testing of agricultural machinery.

The Committee consists of representatives of the Agricultural Engineers' Association, the Dairy Appliance Manufacturers' Association, the Society of Motor Manufacturers and Traders, the National Association of Agricultural Engineers and Implement Dealers, the National Farmers' Union, the Royal Agricultural Society of England, the Central Chamber of Agriculture, the Central Landowners' Association, and the National Agricultural Labourers and Farm Workers' Union, in addition to certain agricultural scientists and experts.

The Chairman of the Committee will be Sir Douglas Newton, K.B.E., and the Secretary, Mr. P. Barker, of the Ministry of Agriculture and Fisheries.

* * * * *

THE Ministry, on the recommendation of the Potato Advisory Committee and with the approval of the Agricultural Advisory Committee, has decided to make certain changes in the Orders dealing with wart disease. The effect of them is to allow the planting of non-immune varieties of potatoes on land in wart disease infected areas, provided such land is not actually infected or known to have been infected with the disease, and to give greater protection against the spread of the disease to other districts.

**New Orders
Dealing with
Wart Disease.**

As the first step, the Ministry has issued a short order amending certain sections of the Wart Disease of Potatoes Order of 1919, so as to permit the planting of any varieties of potatoes on the clean lands in infected areas. With regard to the land actually infected, or known to have been infected, the Order permits the planting therein only of those varieties which have been approved by the Ministry as immune to the disease and which have been certified by a government inspector as reasonably free from "rogues;" though, in addition, permission is given to plant on any such land seed saved from the crop grown on that land in a previous year. No licence will be required in future for the movement of seed potatoes into wart disease infected areas.

No potatoes grown outside the United Kingdom will be permitted to be planted in England and Wales unless the Ministry issues a licence allowing it.

After the close of the next planting season, a further order will be issued prohibiting the movement out of any infected area to any clean area of potatoes grown in an infected area except "ware" potatoes of immune varieties. These will be permitted to be sent to districts which are infected areas, provided they are accompanied by a statement to the effect that they are of an approved immune variety, that they were grown in an infected area, and that they will not be used for planting. This order will also provide that no seed potatoes may be sold for planting anywhere in England and Wales unless they have been certified (a) to be of an approved immune variety, true to type and reasonably free from "rogues," or (b) that they were grown on a holding which is not in an infected area and on which wart disease has not occurred.

* * * * *

AGRICULTURE ABROAD.

INFORMATION regarding the rabbit-breeding industry in Belgium has been obtained by Mr. P. A. Francis, of the Live Stock Branch of the Ministry, during a recent visit to that country. The Belgian Ministry of

Rabbit Breeding in Belgium.

Agriculture has not had the opportunity since the War of devoting much attention to the rabbit-breeding industry, owing to the heavy work occasioned by the necessity of replacing the larger live stock. The rabbit industry is nevertheless a considerable one, as it is estimated that about seven million skins are being produced annually in Belgium. Practically all Belgian peasants, and even the townspeople, keep a few rabbits, which are mostly killed for home consumption, the skins being sold to local collectors. The remainder are sold alive, either in local markets or to travelling dealers who kill them and sell the carcasses to butchers, etc., and the skins to curers. Before the War from 150 to 200 tons of "Ostend" rabbits were sent to London from Belgium weekly; such rabbits are not chilled or carried in cold store, the object being to put them on the London market in a fresh condition.

There is a very large rabbit skin factory in Ghent, where before the War several million skins were dressed for fur, chiefly for imitation beaver, chinchilla, seal, marten and ermine, many of which were absorbed in the London market. Regarding prices, good Belgian skins recently realised 1s. 3d. each; although most of them are of no particular breed (probably a cross with the Flemish giant) they are large and they are properly dried. Belgium does not produce sufficient skins for the fur industry, and supplies are purchased in France and England. Complaints are made that the skins from England are, as a rule, so badly taken off the rabbits and so carelessly dried that they are of comparatively little value. During the War, however, as much as 12s. per dozen was paid for English wild rabbit skins, but at the present time they are worth only about a quarter of that price.

From 12,000 to 14,000 skins of the Blue Beveren breed are produced annually in Belgium, chiefly from the Province of Beveren, but not more than five francs (about 2s. 1d.) each is being paid for even the best of the skins. There appears to be an almost unlimited demand for rabbit skins of good quality for making-up purposes and for rabbit fur in its natural undyed state, but only about 25 per cent. of the skins are good

enough for either purpose. The skins produced during the summer months are of inferior quality and are mostly used for making felt for hats, but winter skins are of high quality and are eagerly sought after by the manufacturers. It is improbable, however, that rabbit production as a separate business would be profitable, even allowing for the value of the carcass, but all who are able to keep a few rabbits mainly on waste material should do so, both because they would be producing cheap food and a useful fur. In this respect the Belgian peasants and smallholders show more initiative in exploiting their opportunities than do cottagers and smallholders in this country.

* * * * *

THERE are many agencies in Canada having for their object the encouragement of the production and use of good seed.

**Seed
Improvement
in Canada.**

Among these may be mentioned field crop competitions, combined seed crop and cleaned seed competitions, seed fairs, provincial seed exhibitions, and seed centres, while the Canadian Seed Growers' Association and the Dominion and Provincial Departments of Agriculture take a leading part in the movement.

In the April and June issues of this *Journal* an indication of the methods adopted to improve the Canadian wheat crop by means of breeding new varieties and distributing them to farmers at low cost was given. Further particulars of the campaign for good seed, including crops other than wheat, are contained in the *Agricultural Gazette of Canada* for March-April last. The experimental Farms Branch of the Dominion Department of Agriculture has a number of Illustration Stations in various parts of the country. An example of the value of these stations is cited: farmers in the vicinity of a station were induced last year to grow 850 acres of *clover seed*, estimated to be worth \$50,000 more than would have been the case with the regular crop. The distribution of *tobacco seed* by the Dominion Department has been one of the chief contributory causes of the increasing value and importance of the tobacco industry of Canada; while the extension of the *flax* industry, both in connection with fibre and seed, is largely due to the activity of the Flax Division of the Experimental Farms Branch.

The Seeds Branch promotes the greater production and use of first-quality seed in several ways. In addition to its seed inspection service, which helps to prevent the sowing of dirty, non-vital seeds, it supports the Canadian Seed Growers' Associa-

tion in its work of producing registered seed, it provides a service of market intelligence to growers, and it pays cash subventions to the Provincial Departments of Agriculture.

The combined seed crop and cleaned seed competitions, which are a recent introduction, have two distinct phases. The first consists of a standing field crop competition; the second of a thrashed and cleaned seed competition, in which the seed is judged in the granaries of the competitors, after thrashing. Awards are based on the combined scores—35 per cent. on the field score, 65 per cent. on the bin score. The cleaned seed part of the competition is thus recognised as the more important. This system of awarding prizes now applies to all seed crops, except potatoes, in which case the basis is reversed, namely 65 per cent. on the field score and 35 per cent. on the bin score. The foundation seed used by competitors must be of approved origin, that is, it must have been either registered or approved by the seed committee of the Province; the minimum quantities of cleaned seed submitted vary from 15 bushels in the case of clovers and timothy to 200 bushels in the case of oats.

The primary object of these combined competitions is to encourage the development of commercial seed centres such as are promoted by the Canadian Seed Growers' Association and other organisations. The demand for superior quality seed has grown materially during the last few years, and it is claimed that the combined competitions stimulate the production of the special kinds of seeds most suitable to the different localities, this being the chief purpose of the seed centres.

With regard to *potatoes* the Markets Division of the Seeds Branch has made a detailed survey of available supplies. It knows the location, quantity and varieties of the seed, all of which is the product of fields inspected by trained pathologists. To be eligible for certification the growing crop must pass the Department's inspection standard for freedom from disease, and purity of variety. They are then graded, sacked, sealed and marketed on the basis of the Department's certificate. Comparative yields from certified seed and common local stock seed are well illustrated by the results of the 1920 demonstrations in Ontario. For instance, Green Mountain certified seed from New Ontario gave a yield of 218.3 bushels per acre, as compared with 189.2 bushels per acre from common stock.

AGRICULTURAL RETURNS, 1921.

PRODUCE OF CROPS IN ENGLAND AND WALES.

The following Memorandum on the Agricultural Returns of England and Wales for 1921 was issued by the Ministry on 2nd November:—

Winter corn was drilled into a good seed bed and spring sowing was also carried out under good conditions, though some heavy soils became baked and the seed beds consequently rough. The autumn-sown crops stood the long drought very well, and those sown early in the spring remained satisfactory, but late sowings, especially on rough land, suffered very considerably. Spring corn generally was short in the straw. Beans were damaged by fly, and peas did not fill very well owing to the drought. Crops were harvested under very favourable conditions generally, only a little corn in the north and west being damaged by wet. The grain is of good quality, except in the case of late sown spring crops, which gave small, thin grain.

The total production of wheat in England and Wales is estimated at 8,723,000 quarters, which is rather more than 2,000,000 quarters greater than in 1920, and larger than in any year since 1898, with the exception of 1918, when the area of this crop was greatly increased as a result of the Food Production Campaign. The yield per acre over the whole country is estimated at 35·3 bushels, or nearly 5 bushels above the average of the previous 10 years, and the highest recorded since official returns of production were first collected in 1885. The total production of barley is 5,309,000 quarters, or 1,000,000 quarters less than in 1920 and 350,000 quarters less than the average of the 10 years 1911–20. The yield per acre is estimated at 29·6 bushels, which is about $1\frac{1}{2}$ bushels per acre below the 10-year average. Oats were also a light crop, the yield per acre being estimated at 37·3 bushels, which is over 1 bushel per acre below average, and half-a-bushel less than last year. The total production, which amounted to 10,022,000 quarters, is about 700,000 quarters less than in 1920. In some districts there were many very poor fields of oats, and also of barley, but there were, however, a large number of crops which did well and thrashed out better than was expected. The yield of mixed corn is estimated at 33·8 bushels per acre, and the total production at 570,000 quarters, or 30,000 quarters less than in 1920, when the acreage was larger. The total production of beans is, apart from 1917, the smallest since 1904, and, at 778,000 quarters, is 180,000 quarters less than last year. The yield per acre is estimated at 26·2 bushels, which is 1 bushel below average and about 5 bushels less than in 1920. The yield of peas was also poor, being only 23·7 bushels per acre, or about $1\frac{1}{2}$ bushels below the 10-year average, and the total production, 313,000 quarters, is 130,000 quarters less than last year.

Hay suffered considerably from the very dry spring, and the total crop is one of the lightest recorded. The crop, however, was well secured, and is of good quality. Seeds' hay yielded 24·4 cwt. per acre, which is 4 cwt. per acre below average, and lower yields per acre have only been recorded six times in the last 35 years. The total production was 2,142,000 tons, or 440,000 tons less than last year. The yield of meadow hay was about 15·8 cwt. per acre, or 6 cwt. per acre below average. Crops were bad in all parts of the country.

The total production is estimated at 3,197,000 tons, or 2,430,000 tons less than in 1920, and this and the yield per acre are the lowest recorded except for the year 1893. The total quantity of hay produced is thus about 5,340,000 tons, which is about 35 per cent. less than last year, and about 2,000,000 tons less than the average of the 10 years 1911-20.

The estimate of the hop crop was issued on 20th October.* The estimates of the potato and root crops will be issued later in the year.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1921.

PRELIMINARY STATEMENT showing the Estimated Total Produce and Yield per Acre of the CORN, PULSE and HAY CROPS in England and Wales in the Year 1921, with Comparisons for 1920, and the Average Yield per Acre of the Ten Years 1911-1920.

—	Crops.	Estimated Total Produce.		Acreage.		Average Estimated Yield per Acre.		Average of the Ten Years 1911-1920.
		1921.	1920.	1921.	1920.	1921.	1920.	
ENGLAND AND WALES.		<i>Qr.</i>	<i>Qr.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>
	Wheat ..	8,723,000	6,669,000	1,976,203	1,874,585	35.3	28.5	30.5
	Barley ..	5,309,000	6,335,000	1,435,524	1,636,960	29.6	31.0	31.0
	Oats ..	10,022,000	10,746,000	2,147,421	2,265,624	37.3	37.9	38.4
	Mixed Corn ..	570,000	606,000	134,898	146,324	33.8	33.1	—
	Beans ..	778,000	957,000	237,182	246,314	26.2	31.1	27.2
	Peas ..	313,000	443,000	105,699	129,311	23.7	27.4	25.0
		<i>Tons.</i>	<i>Tons.</i>			<i>Cwt.</i>	<i>Cwt.</i>	<i>Cwt.</i>
	Seeds' Hay*	2,142,000	2,584,000	1,757,474	1,674,442	24.4	30.9	28.4
	Meadow Hay†	3,197,000	5,627,000	4,052,505	4,394,948	15.8	25.6	21.8
ENGLAND.		<i>Qr.</i>	<i>Qr.</i>			<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>
	Wheat ..	8,586,000	6,515,000	1,937,453	1,824,037	35.5	28.6	30.5
	Barley ..	5,069,000	5,982,000	1,355,773	1,537,735	29.9	31.1	31.1
	Oats ..	9,267,000	9,846,000	1,932,063	2,016,531	38.4	39.1	39.0
	Mixed Corn ..	496,000	512,000	114,003	120,571	34.8	34.0	—
	Beans ..	774,000	950,000	235,910	244,456	26.3	31.1	27.2
	Peas ..	312,000	442,000	105,362	128,744	23.7	27.5	25.0
		<i>Tons.</i>	<i>Tons.</i>			<i>Cwt.</i>	<i>Cwt.</i>	<i>Cwt.</i>
	Seeds' Hay ..	1,953,000	2,327,000	1,568,492	1,486,149	24.9	31.3	28.7
	Meadow Hay ..	2,842,000	5,071,000	3,569,033	3,902,520	15.9	26.0	22.0
WALES.		<i>Qr.</i>	<i>Qr.</i>			<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>
	Wheat ..	137,000	154,000	38,750	50,548	28.3	24.3	27.5
	Barley ..	240,000	353,000	79,751	99,225	24.1	28.5	30.1
	Oats ..	755,000	900,000	215,358	249,093	28.1	28.9	34.2
	Mixed Corn ..	74,000	94,000	20,895	25,753	28.4	29.2	—
	Beans ..	3,700	6,900	1,272	1,858	23.5	29.5	27.4
	Peas ..	800	1,500	337	567	19.3	22.2	22.3
		<i>Tons.</i>	<i>Tons.</i>			<i>Cwt.</i>	<i>Cwt.</i>	<i>Cwt.</i>
	Seeds' Hay ..	189,000	257,000	188,982	188,293	20.0	27.3	25.3
	Meadow Hay ..	355,000	556,000	483,472	492,428	14.7	22.6	19.8

* Hay from Clover, Sainfoin, and Grasses under rotation.

† Hay from Permanent Grass.

* This *Journal*, November, 1921, p. 767.

* * * * *

Past issues of the "Journal" and "Journal Supplements" for sale.—Readers of this *Journal* whose sets are incomplete may still obtain missing copies from the Ministry at the original prices. Most of the copies available are in good condition, but in some instances only one or two are in stock. *Supplies of the following are exhausted* :—

Vol. II, No. 4. Vol. IV, No 3. Vol. IX, No. 2.

Applications, with remittances, should be addressed to The Ministry of Agriculture, 10, Whitehall Place, London, S.W. 1. The prices are :—

Vols. I to IV	6d. per single copy (quarterly)	} post free.
" V to X	...	...	1s. " " " " (monthly)
" XI to XXVI (No. 9)			4d. " " " "	
" XXVI (No. 10) to XXVII			6d. " " " "	

Copies of *Journal Supplements* are also available, excepting Nos. 4. and 8. A list of these, with prices, may be obtained on application.

Storage of Potatoes.—Owing to the abnormal climatic conditions which have prevailed during the past growing season, large quantities of immature potato tubers are now being harvested in many parts of the country. Under the most favourable conditions of ripeness, there is always some danger of decay in the pits (clamps). This winter, potato tubers may be expected to fall a prey to unsuitable conditions of temperature and fungoid attack more readily than in a normal season. Potato growers are therefore advised to defer the final soiling-up of their clamps for as long a period as the conditions of external temperature (frost) will warrant, and thus obviate as far as possible high temperatures in the clamps immediately after storing.

All growers would do well to consult the article entitled "Causes of decay in Potato Clamps" in the Supplement to the Ministry's *Journal* of March, 1919, commencing page 48.

Disease in Geese from Poland.—Some thousands of geese have recently arrived in this country from Poland and are being fattened on farms in several counties. The Ministry desires to inform farmers and poultry-keepers that cases of a disease which appears to be Fowl Cholera have broken out in certain batches of these geese. The disease is infectious and therefore liable to spread amongst other poultry stock upon the farm or occupation. From present reports, the geese die after two or three days' illness, the symptoms being drooping wings, sunken eyes, rapid loss of condition, weak gait, and, sometimes, diarrhoea.

The Ministry is making immediate enquiries into the matter with a view to a definite diagnosis of the disease and the discovery of all localities in which it exists. Meanwhile, any persons having imported geese on their land are advised to communicate at once with the Ministry, at No. 10, Whitehall Place, London, S.W.1, should the disease make its appearance amongst the bird stock on their premises. If death occurs in any case, a specimen carcass should be sent without delay to the Ministry's Veterinary Laboratory, New Haw, Weybridge (Addlestone Station, L & S.W.R.); it should be securely packed and covered, with the name and address of the sender upon it, other particulars being sent by post.

The Seeds Act, 1920.—Under the Seeds Act, 1920, all tests for the purpose of a Declaration under the Act, except in the case of garden seeds, must be made either at one of the Official Seed Testing Stations, or at a Private Station

licensed by the Ministry for that purpose. A Declaration based on a test carried out at a non-licensed station is, therefore, illegal.

The Ministry had already announced that arrangements could not be made for any further inspections this year of establishments for which a license was desired; but as it was understood that the announcement passed unnoticed by a number of firms who always made it a practice to test their cereal seeds before delivery to their customers, it was decided to extend the period, during which applications for licenses to test cereal seeds only might be made, to 5th November, 1921.

Licenses will be issued only in cases where the Ministry is satisfied that the equipment and management of the establishment is in every way adequate for the proper carrying out of tests, and only for the purpose of testing seeds required by the licensee for his own purchases and sales.

International Year-Book of Agricultural Legislation, 1920.—

The International Institute of Agriculture, Rome, has recently issued its tenth Year-Book of Agricultural Legislation. The volume contains an introduction in English, in which the general course of the legislation of the world in 1920, bearing upon agriculture, is outlined. The remainder of the volume, in French, gives, in summarised form and under their relative subject heads, the various agricultural enactments, decrees and statutory orders of the chief countries of the world.

The price of the publication is 11s. 11d. Remittances should be forwarded to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W. 1.

The London Thoroughbred Stallion Show for 1922.—

The Ministry gives notice that a Show of Thoroughbred Stallions will be held, in conjunction with the Hunters' Improvement and National Light Horse Breeding Society, at the Royal Agricultural Hall, Islington, on 28th February, 1st and 2nd March, 1922.

A Challenge Cup presented by H.M. The King will be awarded for the Champion Stallion in the Show; and a Gold Medal will be awarded by the Ministry to the owner. 60 King's Premiums (including 12 Super-Premiums) will also be offered for award by the Ministry.

In addition to the King's Premiums, a very limited number of Ministry's Premiums will be available for award on the recommendation of the County Horse Breeding Committees. These awards will not be made, however, until the routes of the King's Premium Stallions have been arranged.

Agricultural Research Scholarships and Fellowships.—The Ministry, on the recommendation of the Advisory Committee on Agricultural Science, and with the approval of the Development Commissioners and the Treasury, has awarded *Research Scholarships* of the value of £200 per annum to the following candidates :—

Mr. A. E. Watkins, B.A., Cambridge (Botany), for two years.

Mr. D. Cuthbertson, B.Sc., Glasgow (Chemistry), for one year.

Mr. R. A. Glover, M.A., B.Sc., Edinburgh (Veterinary Science), for two years.

Mr. T. W. M. Cameron, M.R.C.V.S., Royal Veterinary College (Veterinary Science), for two years.

Travelling Research Fellowships of £250 each have been awarded to :—

Mr. B. A. Keen, Soil Physicist at the Rothamsted Experimental Station, for a visit to America in the Autumn of 1921.

Professor R. G. Stapledon, Director of the Aberystwyth Plant Breeding Station, for a visit to America in 1922.

The Scholarships have been established to assist promising candidates to qualify as research workers with a view to their contributing to the development of agricultural and veterinary research.

Travelling Fellowships were instituted last year to enable selected members of the staffs of research institutes aided by the Ministry to visit institutions abroad where work on similar or cognate subjects is carried on and to study at first hand the methods employed there.

Leaflets issued by the Ministry.—Since the date of the list given on page 763 of the November issue of the *Journal*, three new leaflets have been issued :—

No. 370.—Nitrogenous Manures.

„ 371.—The Packing of Eggs for Hatching and the Management of the Sitting Hen.

„ 377.—“ Reversion ” or Nettlehead of Black Currant.

The following leaflets have been re-written :—

No. 4.—Winter Moths.

„ 41.—Red Spiders.

„ 98.—Grading and Packing of Apples.

The following have been revised :—

No. 105.—Wart Disease.

„ 162.—Propagating Apples, Pears, Plums, and Cherries.

„ 255.—The Workmen's Compensation Act, 1906.

„ 279.—Technical Advice for Farmers.

„ 290.—The Cattle Testing Station of the Ministry of Agriculture and Fisheries.

„ 352.—The Control of Pests of Fruit Trees in Gardens and Small Orchards.

The following has been withdrawn :—

F.P. 53.—Storage of Sulphate of Ammonia.

Distribution of Leaflets.—The leaflets issued by the Ministry have hitherto been issued free of charge, but in view of the increased cost of printing and paper, and the need for economy in Government expenditure, it has been decided that a charge must in future be made in all cases where more than one (or at the most two) leaflets are required.

Persons who require information on a definite point dealt with in one of the leaflets can therefore obtain the leaflet in question free of charge, but if several leaflets are required, a charge will be made at the rate of 1d. each or 9d. per dozen, post free. Where groups of leaflets dealing with specific subjects are required, the new Sectional Volumes of leaflets should be purchased.

Leaflets required by Agricultural committees, local education authorities, agricultural colleges, farm institutes, farmers' clubs, allotment societies, etc., for distribution, will be supplied at the rate of 4s. per 100, carriage free.

Sectional volumes, any bound sets of leaflets, and miscellaneous publications, will be supplied in quantities of 20 and upwards to the above-mentioned bodies (but not to private individuals) at 10 per cent. discount on the published price.

* * * * *

QUESTIONS IN PARLIAMENT.

Warble Fly.—Sir B. Stanier asked the Minister of Agriculture whether he could give any information regarding the findings of the committee to investigate the warble fly problem; and whether they had found any new preventative?

Sir Arthur G. Boscawen: The investigations of the committee appointed to report on the warble fly are not yet completed, but I am advised that the committee are very hopeful that an effective preventive against attacks of this pest has been discovered. Experiments have recently been tried with a wash composed of tobacco powder mixed with lime, and very encouraging results have been obtained. (October 20, 1921.)

Unfit Horses (Export).—Capt. W. Benn asked the Minister of Agriculture whether the inspectors appointed to inspect horses about to be exported can order unfit animals to be destroyed and enforce such orders?

Sir Arthur G. Boscawen: Yes, Sir. Section 1 of the Exportation of Horses Act, 1914, empowers the veterinary inspector to slaughter or cause to be slaughtered, whether the owner consents to such slaughter or not, any horse examined by him which he finds to be in such a physical condition that it is cruel to keep it alive or which is permanently incapable of being worked without suffering. The Act provides no appeal against the inspector's decision, which can be duly enforced. (October 20, 1921.)

In reply to a question by Sir J. Butcher, Major Barnston, on behalf of the Minister, stated that the measures which have been adopted by the Ministry to raise the standard of fitness of horses exported to the Continent have resulted in stopping the export trade in worn-out horses, and in restricting the trade to horses which are fully fit to work. The high standard of fitness now enforced has also resulted in the slaughter in this country of a much larger proportion than formerly of horses which are intended for food on the Continent. As a result of conferences which took place between the Ministry and representatives of the Dutch and Belgian Governments during the past summer, dressed carcasses of horses slaughtered in this country and officially inspected will be accepted in Holland and Belgium. (October 25, 1921.)

Railway Rates (Agricultural Produce.)—In reply to a question by Mr. Royce regarding railway rates for agricultural produce, the Parliamentary Secretary to the Ministry of Transport said that in the general increase in railway rates which took effect in January, 1920, certain classes of fertilisers and agricultural produce were either exempted from increase or were subjected to a lower rate of increase than other traffic, as recommended by the Rates Advisory Committee. On reviewing the rates in

July, 1920, the same Committee did not see their way to recommend the continuance of these concessions to agriculturists, and the charges on agricultural produce were, therefore, increased in September, 1920, by the same percentage over 1919 rates as applied to other merchandise in the same classification, with the exception that the increase on specified manures was limited to 50 per cent. The provisions of the Agriculture Act, 1920, had no bearing on the matter: the increased rates of September, 1920, were intended to secure sufficient additional revenue in 11 months to produce financial equilibrium over the last 16 months of control, but the depression in trade and the coal stoppage largely defeated this aim and rendered any general reduction in rates before the end of Government possession impracticable. It is, however, open to the agricultural interests to make application to the Rates Tribunal under Section 60 of the Railways Act, 1921, for a reduction in existing rates, if they so desire. (October 25, 1921.)

Corn Production Acts (Subsidy Claims).—In reply to a question by Mr. Glanville, Sir Arthur G. Boscawen stated that the total number of claims received is approximately 194,000, relating to 1,937,000 acres of wheat, 2,063,000 acres of oats, and 130,000 acres of mixed corn. The investigation of the claims will not be completed for some time yet. These figures, therefore, include some duplicate and other inadmissible claims. (October 24, 1921.)

In reply to a question by Mr. A. Herbert, the Minister of Agriculture stated that the interpretation of Section 1 of the Corn Production Act, 1917, as regards fractions of an acre has been referred by the Ministry of Agriculture and Fisheries and the Board of Agriculture for Scotland, jointly, to the Law Officers of the Crown, for both countries for their opinion. The Law Officers have advised that the Departments are not liable to make any payments in respect of fractions of an acre, and that they have no power by Regulation to legalise such payments. (October 31, 1921.)

Land Settlement.—Mr. C. White asked how many men had been settled on the land under the Land Settlement Acts from 1st January, 1919, to 1st October, 1921?

Sir Arthur G. Boscawen: Complete returns of Michaelmas lettings are not yet available, but the total number of men settled on the land by councils between the dates mentioned is estimated to be 15,750, to which should be added 712 provided with holdings or employed on the Ministry's farm settlements. Of the total number thus settled, 14,786 are ex-service men. (October 24, 1921.)

Fertilisers.—In reply to a question by Mr. Gardiner, Sir Arthur G. Boscawen stated that the prices at which fertilisers may be sold in the United Kingdom are not now controlled by the Government in any way. Supplies of all the principal fertilisers are, it is understood, more than sufficient to meet the demand, and considerable reductions in price have taken place during the last few months. There is no reason to suppose, therefore, that farmers will be asked to pay unreasonable prices for their fertilisers next season. (October 24, 1921.)

Potatoes (Diseases).—Mr. Gardiner asked whether he was aware that very large quantities of potatoes were being offered from countries where there was no inspection for wart or other infectious diseases; and whether he would take such action as would protect this country from the danger of such

diseases being spread over very large areas now quite free from such contamination?

Sir Arthur G. Boscawen: Arrangements are made in most countries for the inspection of potatoes which are intended for export, and consignments are then accompanied by certificates of health issued by the Government of the country concerned. By an order of the Ministry issued under the Destructive Insects and Pests Acts, which came into operation on 1st October, 1921, potatoes imported into this country without an official certificate as to their freedom from disease are liable to examination, and if found to be unhealthy may be either re-exported or destroyed. (October 24, 1921.)

Canadian Cattle.—Sir B. Stanier asked the Minister of Agriculture for the number of milch cows, yearlings and two-year-old steers and calves in Canada in the years 1919, 1920 and 1921.

Sir Arthur G. Boscawen: The number of cattle in Canada in June, 1919, as published by the Dominion Government, was as follows:

Bulls	...	...	...	300,471
Milch Cows	...	...	...	3,548,437
Calves	...	...	...	2,424,299
Steers	...	...	...	840,319
Other Cattle	...	...	...	2,971,555
Total	...	...	...	<u>10,085,081</u>

The Dominion Government have published the following figures of the number in June, 1920:

Milch Cows	...	...	...	3,530,238
Other Cattle	...	...	...	5,947,142
Total	...	...	...	<u>9,477,380</u>

Further details in regard to 1920 have not yet been published. Figures for 1921 are not yet available.

* * * * *

NOTICES OF BOOKS.

Birds One Should Know—Beneficial and Mischievous.—(The Rev. Canon Theodore Wood: illustrated by Roland Green, F.Z.S. Gay & Hancock, Ltd, 34, Henrietta Street, Covent Garden, London, W.C. 2. Price 10s. 6d. net.) The influence of the country's fauna on crop production for good or evil is so great that works approaching the subject from this point of view are welcome. The book under notice, with the help of its lavish illustrations, will enable readers to identify the more common birds of the countryside—"birds one should know," as the title rightly indicates. Together with a short outline of habits, a few words are said which attempt to give the subjects chosen their character as beneficial or the reverse. With birds this is a difficult matter, and it may be suspected that the author has found it so. Even with the more exact information which is gradually being amassed as to the food of birds, the position of several species is still difficult to appraise. With a number it is easy to say they are all good, but with few is it possible to say they are all bad and with many it is difficult to decide upon which side lies the

balance of utility or harm. The author of this book, however, has approached his task in a fair and impartial spirit.

In such a controversial subject it would be strange if some grounds, however small, were not found for criticism. The sparrow seems to get more and the bullfinch less than a fair meed of praise, the aphid-eating propensities of the latter not being mentioned. Also, the thistleheads on the frontispiece would surely have been better shown with the seeds in a ripe condition!

What the author considers to be salient points about each bird are given shortly and concisely, and the plates and text figures lose nothing by being produced in an artistic and attractive form.

Ministry's Register of Dairy Cows with Authenticated Milk Records.—The Fourth Volume of the Ministry's Annual Register of Dairy Cows with authenticated Milk Records is now available. It contains particulars, including a list of the owners and breeders, of 5,147 cows in respect of which certificates have been issued by the Ministry showing that they have yielded 8,000 lb. or over of milk during the milk recording year ended 1st October, 1920, or an average of 6,500 lb. for that year and one or more preceding consecutive years. The existence of this register is not as widely known as it ought to be, but a growing appreciation of its usefulness is indicated by the fact that the number of entries in the fourth volume is about ten times that in the first volume, and the number of owners whose cows are entered has multiplied nearly eight times.

Sixteen recognised breeds or types are represented in the fourth volume, as compared with only five in the first volume, and there are in addition 459 cross-bred cows (*i.e.*, cows which do not conform to one recognised breed or type) whose milk yields have justified their inclusion under the standard required. Of the 5,147 cows entered in the fourth volume, 4,080 gave over 8,000 lb. of milk during the year, and the remainder were entered on an average of 6,500 lb. or over. Of the 4,080 cows which were entered on the one year's yield 2,115 gave between 8,000 and 9,000 lb.; 1,050 between 9,000 and 10,000 lb.; 534 between 10,000 and 11,000 lb.; 218 between 11,000 and 12,000 lb.; 80 between 12,000 and 13,000 lb.; 44 between 13,000 and 14,000 lb.; 17 between 14,000 and 15,000 lb.; 9 between 15,000 and 16,000 lb.; 7 between 16,000 and 17,000 lb.; 2 between 17,000 and 18,000 lb.; 2 between 18,000 and 19,000 lb.; and 2 between 20,000 and 21,000 lb.

The objects of this register are (1) to assist and encourage the breeding and improvement of dairy cattle of any breed, type or cross by providing authentic records of cows which have been proved to possess high class dairy qualifications, (2) to bring sellers and buyers together, and (3) to record particulars of the breeding of cows so as to encourage the use of pedigree bulls for grading up non-pedigree herds which may thus become eligible for recognised herd books in due course. To enable a cow to be entered in a herd book, evidence is needed to prove that the foundation cow was an animal of the breed to which the herd book refers, and that her descendants were sired by pedigree bulls of that breed.

Many dairy farmers, before purchasing a cow, now insist on obtaining a proof of her milk yield in the past, and there is no doubt that increasing importance is being attached by them to the milk records of cows offered for sale. To verify this statement, one has only to notice the enhanced prices obtained for those cows (and progeny) whose milk records have been certifi-

ated by the Ministry or entered in the Register of Dairy Cows. Breeders of dairy cattle and persons about to start or replenish a dairy herd would be well advised, therefore, to make the fullest use of the information afforded by the register.

Copies of the fourth volume of the register may be obtained on payment of 10s. (10s. 9d. post free) either direct from the Ministry at 10, Whitehall Place, S.W.1, or through any bookseller from H.M. Stationery Office, Imperial House, Kingsway, London, W.C.2.

* * * * *

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous.

- Fabre, J. H.*—“The Story of the Fields.” (271 pp.) London: Hodder & Stoughton, Ltd., 1921, 8s. 6d. [63(022).]
- U.S. Department of Agriculture.*—Department Circular 152:—Organization and Result of Boys' and Girls' Club Work. (8 pp.) Washington, 1921. [372.]
- Cherry, T.*—Victorian Agriculture: A Textbook of the Principles and Methods underlying the Pastoral and Agricultural Industries of South Eastern Australia. (301 pp.) Melbourne: Paterson & Co., 1913. [63(945).]
- Weir, W. W.*—Productive Soils. [Lippincott's Farm Manuals.] (398 pp.) Philadelphia & London: J. B. Lippincott Co., 1920, 10s. 6d. [63.1.]
- King, J. S.*—The Determination of Farm Profits. (12 pp.) Loughborough: The Midland Agricultural & Dairy College, 1921. [657.]
- British Association for the Advancement of Science.*—The Advancement of Science, 1921. Addresses delivered at the 89th Annual Meeting at Edinburgh, September, 1921. (230 pp.) London: John Murray, 1921, 6s. [06; 37(04).]
- Daehnfeldt, L.*—Veiledning i Havefroavl. (2nd Edition.) (275 pp.) Odense: Milo'ske Boghandels Forlag, 1919. [63.5(02); 63.1951.]
- Farmer, R. C.*—Industrial and Power Alcohol. (110 pp.) London: Pitman & Sons, 1921, 2s. 6d. net. [663.5.]
- Tweedy, R. N.*—Industrial Alcohol. (88 pp.) Dublin: Co-operative Reference Library, 1917, 1s. [63.344; 663.5.]
- Weaver, Sir L.*—Land Settlement Building Work of the Ministry of Agriculture and Fisheries. Extract from Journal of the Royal Inst. of Brit. Architects, Vol. XXVIII, No. 11, 1921. (309-340 pp.) London, 1921, 1s. 6d. [325; 69(02).]
- Department of Scientific and Industrial Research. Fuel Research Board.*—The Winning, Preparation and Use of Peat in Ireland. Reports and other documents. (76 pp.) H.M. Stationery Office, 1921, 3s. [662.6.]
- Falk, K. G.*—The Chemistry of Enzyme Actions. (136 pp.) New York: Chemical Catalog Co., 1921. [54(02).]
- Atkinson, A. G. B.*—Tithe Rentcharge. (21 pp.) London: Society for Promoting Christian Knowledge, 1921, 1s. net. [348.]
- Mairet, Ethel M.*—A Book on Vegetable Dyes. (148 pp.) (3rd Edition.) Ditchling, Sussex: S. Dominics Press, 1920, 5s. [63.342.]

Field Crops.

- Newsham, J. C.*—Crops and Tillage. (186 pp.) London: Methuen & Co., Ltd., 1921, 6s. net. [63.3(02); 63.19.]
- Cunningham, J. C.*—Products of the Empire. (299 pp.) Oxford: Clarendon Press, 1921, 5s. 6d. [63(022); 31(42).]
- Myrick, H.*—The Hop: Its Culture and Cure, Marketing and Manufacture. (300 pp.) New York: Orange Judd Co., 1914. [63.3451.]
- Murke, F.*—Beet Sugar: Condensed Description of its Manufacture. (175 pp.) New York: J. Wiley & Sons, 1921, 15s. [664.1.]
- Tennessee Agricultural Experiment Station.*—Bull. 12:—Lespedeza (Japan Clover). (28 pp.) Tennessee, 1921. [63.33(b).]

Horticulture.

- Wright, S. T.*—Fruit Culture for Amateurs. With Notes on Injurious Insects and Fungi by W. D. Drury. (116 pp.) (5th Edition.) London: "The Bazaar Exchange & Mart" Office, 1s. 6d. net. [63.41(02).]
- Hayes, F. C.*—A Handy Book of Horticulture. (225 pp.) London: J. Murray, 1921, 5s. [63.5(02).]
- Hodge, J. M.*—Raspberry Growing in Scotland. (118 pp.) Edinburgh: The Scottish Smallholders' Organisation, Ltd., 1921. [63.41 (c).]
- Bunyard, E. A.*—A Handbook of Hardy Fruits: Apples and Pears. (204 pp.) London: John Murray, 1921, 7s. 6d. [63.41(a).]
- Bretignière, L.*—La Pomme de Terre et le Topinambour (Jerusalem Artichoke). (200 pp.) Paris: Librairie Agricole de la Maison Rustique, n.d., 7 fr. 50. [63.511; 63.512(02).]

Plant Diseases.

- New York Agricultural Experiment Station.*—Bulletin 475:—Insect Injuries in Relation to Apple Grading. (42 pp.) Geneva, 1920. [63.27-41.]
- Arkansas Agricultural Experiment Station.*—Bulletin 167:—The Mosaic Disease of Sweet Potatoes. (10 pp. and Plates.) Fayetteville, 1920. [63.24.]
- Sanderson, E. Dwight.*—Insect Pests of Farm, Garden and Orchard. (2nd Edition, Revised and Enlarged by L. M. Peairs.) (707 pp.) New York: John Wiley & Sons; London: Chapman & Hall, 1921, 26s. net. [63.27(02).]

Live Stock.

- Kansas Agricultural Experiment Station.*—Circular 89:—Swine Feeding Investigations, 1919-20. (10 pp.) Manhattan, 1921. [63.645.]
- Washington Agricultural Experiment Station.*—Bull. 157:—Pea Straw for Fattening Beef Cattle. (24 pp.) Washington, 1920. [63.625.]

Veterinary Science.

- Michigan Agricultural Experiment Station.*—Technical Bulletin 49:—Studies in Infectious Abortion. (30 pp.) East Lansing, 1920. [619.2(a).]

Dairying and Food, General.

- Dairy Farming on Arable Land: Five Prize Essays. (144 pp.) Liverpool: R. Silcock & Sons, Ltd., 1921. [63.70(02).]
- Newsham, J. C.*—"Dairy Farming." (Housing, Feeding, Breeding, Milk, Butter and Cheese.) (174 pp.) London: C. Arthur Pearson, Ltd., 1920, 3s. 6d. [63.70(02).]
- Mortensen, M.*—Management of Dairy Plants. (358 pp.) New York: The Macmillan Co., 1921. [63.718.]
- U.S. Department of Agriculture.*—Bulletin 970:—Manufacture of Cows'-Milk Roquefort Cheese. (28 pp.) Washington, 1921. [63.736.]
- South Dakota Agricultural Experiment Station.*—Bulletin 188:—Relative Values of Feed Proteins for Dairy Cows. (163-204 pp.) Brookings, 1920. [612.394; 63.711(04).]
- Plimmer, R. H. A.* (*War Office Directorate of Hygiene*).—Analyses and Energy Values of Foods. (255 pp.) London: H.M. Stationery Office, 1921, 6s. net. [612.39.]
- Agricultural Costings Committee.*—Final Report on an Investigation into the Cost of Milk Production. (18 pp.) H.M. Stationery Office, 1921, 3d. net. [63.714.]
- Harrow, D. B.*—Vitamines. (219 pp.) London: Geo. Routledge & Son, Ltd., 10s. 6d. [612.39.]

Natural History, Birds, Poultry and Bees.

- British Museum (Natural History).*—Furniture Beetles: Their Life History and How to Check or Prevent Damage Caused by the Worm, *C. J. Gahan*. (23 pp.) London, 1920, 6d. [59.169(c).]
- British Museum (Natural History).*—Economic Series No. 12:—The Cockroach: Its Life History and How to Deal With It, *F. Laing*. (18 pp.) London, 1921, 6d. [63.27.]
- Brues, C. T.*—Insects and Human Welfare. (104 pp.) New York: Harvard University Press, 1920, \$2.50. [59.169; 59.57.]

- Arkansas Agricultural Experiment Station.*—Bulletin 163 :—The Influence of Age of Hens on Egg Production. (8 pp.) Fayetteville, 1919. [63.651(04).]
- Brown, E.*—The Poultry Keeper's Vade-Mecum. (170 pp.) London : Stanley Paul & Co., 1921, 2s. 6d. net. [63.651(02).]
- New Jersey Agricultural Experiment Station.*—Circular 115 :—Standard Poultry Houses. (23 pp.) New Brunswick, 1921. [63.6 : 695.]
- Barron, T. and Leigh, J. N.*—The Daily Mail Poultry Book. (142 pp.) London : Associated Newspapers Ltd., 1921, 3s. 6d. net. [63.651(02).]
- Mace, H.*—A Book about the Bee. (138 pp.) London : Hutchinson & Co., 1921, 4s. [63.81(02); 63.81 :09.]
- Royal Society of Edinburgh.*—Transactions, Vol. LII, Part IV, (No.29) :—Isle of Wight Disease in Hive Bees. (737-779 pp.) Edinburgh : R. Grant & Son; London : Williams & Norgate, 1921, 9s. [63.81-09.]
- Incorporated Vermin Repression Society.*—The Rat and How to Kill Him, A. E. Moore. (26 pp.) London : J. Bale, Sons and Danielson, Ltd., 1921, 9d. net. [63.269.]

Engineering.

- Profiteering Acts Department.*—Report on Agricultural Implements and Machinery. (10 pp.) H.M. Stationery Office [Cmd. 1315.], 1921, 2d. [63.17.]
- Porter, J. Edward.*—Activated Sludge Process of Sewage Treatment. Bibliography. (117 pp.) Rochester, N.Y. : General Filtration Co., 1921. [628.2; 01.]
- Whitman, Roger B.*—Tractor Principles : The Action, Mechanism, Handling, Care, Maintenance and Repair of the Gas Engine Tractor. (267 pp.) New York and London : D. Appleton & Co., 1920, \$2.00. [63.17.]
- Jeffery, J. A.*—Text Book of Land Drainage. (256 pp.) New York : The Macmillan Co., 1921, 10s. 6d. [63.14(02).]

Economics.

- Agricultural Wages Board.*—Report of the Committee on Unemployment Insurance in Agriculture. (18 pp.) H.M. Stationery Office [Cmd. 1344.], 1921, 2d. net. [368.4.]
- Committee on Official Statistics.*—Report on the Collection and Presentation of Official Statistics. (39 pp.) H.M. Stationery Office, 1921, 1s. net. [31(42).]
- Konstam, E. M.*—The Law of Income Tax; Income Tax Acts Appended. (519 pp.) London : Stevens & Sons, 1921, 35s. [336.24.]
- Fox, H.*—A Philosophic View of the Land Question. (211 pp.) London : The Kingsley Press, 1921, 5s. net. [338.1.]
- Plunkett, Sir H.*—Oxford and the Rural Problem. (18 pp.) (Barnett House Papers, No. 6.) London : Oxford University Press, 1921, 1s. [338.1.]
- Marshall, A.*—Principles of Economics. (871 pp.) (8th Edition.) London : The Macmillan Co., 1920, 18s. [33.]
- Smith-Gordon, L. and O'Brien, C.*—Co-operation in Ireland. (92 pp.) Manchester : Co-operative Union, Ltd., 1921, 3s. 6d. [334(415).]
- Morman, J. B.*—The Place of Agriculture in Reconstruction. (374 pp.) New York : E. P. Dutton & Co., 1919, 3s. 6d. [33; 325.]
- Penty, A. J.*—Guilds, Trade and Agriculture. (123 pp.) London : G. Allen & Unwin, Ltd., 1920, 5s. [338.1.]
- Bowley, A. L.*—Official Statistics : What They Contain and How to Use Them. (63 pp.) London : Oxford University Press, 1921, 2s. 6d. [311.]
- Davies, C. E. and Pocock, S. E.*—Agricultural Holdings Acts, 1908-1920. (Embodying Part II of Agriculture Act, 1920.) (416 pp.) London : Estates Gazette Ltd., 1921, 15s. [347(a).]
- Harben, H. D.*—Labour and the Land : An Agricultural Policy. (19 pp.) London : Labour Publishing Co., 1921, 6d. [331; 338.1.]
- Bowley, A. L.*—Prices and Wages in the United Kingdom, 1914-20. (228 pp.) Oxford : Clarendon Press, 1921, 10s. 6d. [331; 338.5.]
- Turnor, C.*—The Land and Its Problems. (254 pp.) London : Methuen & Co., Ltd., 1921, 7s. 6d. net. [338.1.]
- Wolff, H. W.*—Rural Reconstruction. (363 pp.) London : Selwyn & Blount, Ltd., 1921, 15s. [33.]

The FARMERS'

"WARDEN"

FOR INSURANCE OF

HORSES and CATTLE.

**STALLIONS, BROOD MARES,
FOALS.**

EMPLOYERS' LIABILITY.

FIRE. DRIVERS' ACCIDENTS.

**MOTOR CARS, FARM TRACTORS,
and GENERAL INDEMNITIES.**



For Best Rates and Terms apply—

WARDEN

INSURANCE COMPANY, LTD.

ESTABLISHED 1875.

Honoured with the Patronage of H.M. THE KING.

Chief Office—21, IRONMONGER LANE. LONDON, E.C. 2.

MANAGER AND SECRETARY: R. R. WILSON.

"Cook's"
Fertilizers

For All Crops

Special Quotations for Truck Loads.

Edward Cook & Co., Ltd., Bow, London,

E.3.



BREEDERS' ANNOUNCEMENTS.

CATTLE.

ABERDEEN-ANGUS.

MACAINSH, JOHN, Congash, Grantown-on-Spey, N.B. —Pure-bred Aberdeen-Angus Cattle.—Particulars on application.

DEVONS.

STANTON, HARWICH.—REGISTERED HERD RED DEVON DAIRY CATTLE. Devons are the best English Dairy Cattle under all conditions and in any climate.

FRIESIANS.

GILSTON PARK HERD OF PEDIGREE BRITISH FRIESIANS, property of A. S. BOWLBY, Esq. Bulls and Bull Calves generally for sale, by imported and other leading sires.—Apply Captain S. E. BUCKLEY, M.C., Gilston Park Estate Office, Harlow, Essex.

ROUGH HERD OF BRITISH FRIESIANS is the herd for production, colour, size, milk and butter-fat. The herd to buy your next bull calf sired by Routh Victory, third prize Dairy Show, 1920, weighing 13½ cwt. at 20 months old, whose dam gave 2,268 gallons, butter-fat 466; the only cow in the kingdom to produce 1,200 lb. of butter in 365 days. Inspection invited.—P. FORD, Molescroft, Beverly.

SHORTHORNS.

WELBECK HERD OF PEDIGREE SHORTHORNS, the property of the Duke of PORTLAND, K.G. Young Bulls and Heifers for sale, from the best strains.—Apply, ALEX. GALBRAITH, Norton, Cuckney, Mansfield.

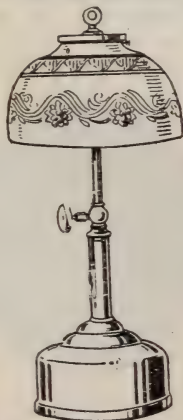
DAIRY SHORTHORNS.

CHIVERS & SONS, LTD., HISTON, CAMBS.—Pedigree Dairy Shorthorns. Over 100 head, mainly fashionably bred Bates Families. Milk recorded daily and checked by Ministry of Agriculture recorder. Champion Cow, reserve champion Bull, 100 Guinea Challenge Cup, R.A.S.B., Derby, 1921, etc. Bulls and Bull calves always for sale.

PLAYFORD HERD OF PEDIGREE DAIRY SHORTHORNS. Deep-Milking Strains of robust constitution. Bulls in service: Thornby Don (133918), Hermit II. (120697). Milk records kept, inspected by Dairy Shorthorn Association and Ministry of Agriculture Recorder. Young Bulls and Bull Calves for sale. Also Breeder of Pedigree Suffolk Sheep and Large Black Pigs.—S. R. SHERWOOD, Playford, Ipswich.

LINCOLN RED SHORTHORNS.

THE STAPLEFORD PARK HERD. A few young Bulls from Royal Prize Winners always for sale from carefully tested milking strains only. Apply C. S. Harvey, Wymondham, Oakham.



No 210 Table Lamp

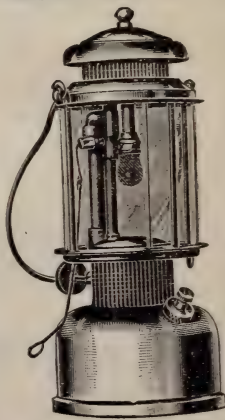
400 C. P. VAPOR LAMPS THAT CAN BE TURNED DOWN TO ANY DESIRED SMALLER C. P.

Safety and satisfaction guaranteed. They burn 95% Air and 5% Petrol Vapor. They are clean and economical. They cost 3d. per hour to run, and at one filling will run a week. The principle in both lamps shown is that applied to a lamp supplied to the U.S.A. Government. Large stocks of both types are on our premises, and we can supply by return. The cost is 60s. each packed and delivered. The Mantles are durable, and the Lantern is storm proof. Everybody who introduces six buyers gets his money back. The Lamps are made of the very best and strongest materials, and are finished in highly-polished nickel. The Light given is twenty times that of the largest oil lamps. Both Lamps are fitted with Automatic Tip Cleaner, and they are the Lamps that never fail. Every Lamp is tested before it reaches user's hands. Exhibition and Demonstration daily from 10 a.m. to 4 p.m. at 357, Oxford Street (first floor), W.1., near Bond Street Station. Admission free.

Suppliers:

STANLEYS (STRATFORD), LTD., Wharton Rd., London, E.15.

Please mention "Journal of the Ministry of Agriculture."



Storm Proof Lantern.

Important.

Hints on buying Phosphate.

- ¶ When buying phosphate it is important to require the seller to describe the solubility as well as to give the phosphate percentage of the material offered.
- ¶ The principal point is how much of the phosphate will be at once available for your crops, and not how much phosphate the fertiliser contains.
- ¶ Insist on being told whether the phosphate is **Water-Soluble**, **Citric-Soluble** or so-called **Insoluble**.
- ¶ For all ordinary soils **Water-Soluble** phosphate is the best and quickest acting phosphate. It is obtainable only in the form of **Superphosphate** or in high-grade **Compound Fertilisers**.

Ask for

—and see that you get—

—Water-Soluble Phosphate.

CATTLE—continued.

KERRY AND DEXTERS.

PALMER, R. E. Pure Pedigree Kerry Cattle, Oaklands Park, Newdigate, Surrey.

HEREFORDS.

WHITE, W. J. S., ZEALS, WILTS.—Old-established Herd of Milking Herefords, Bulls and Calves, for Sale.

SHEEP.

OXFORD DOWN.

AKERS & CO., BLACK BOURTON, OXON.—Registered Oxford Downs, Rams and Ewe Lambs on Sale; inspection invited.

LINCOLN LONGWOOL.

HOYLES, GEO., SKIDBY MANOR, near HULL.—Pure Lincoln Longwool Sheep; true type, sound conditions, lustrous long wool, give satisfaction at home and abroad.

PIGS.

BERKSHIRE.

MANUDEN HERD OF BERKSHIRES. Gilts 11 months by Steadfast (brother to Carry On, Royal Champion, 1919), in pig to Hammond Haymaker, 1st., Oxford, 1920. 20 gns., carriage paid.—**GEE, Manuden House, Essex.**

LARGE WHITE.

CHIVERS & SONS, LTD., HISTON, CAMBS.—Over 1,000 pigs bred annually. Breeding Stock live out in Large Grass Orchards. Stock Boars include Histon Thor, Champion Peterborough and Suffolk 1920, Histon Lion Heart, Champion Royal Norfolk 1919, Dalmeny Macbeth, 1st Highland and Edinburgh 1920, and own brother to 720-guinea Sow. Young Stock always for Sale.

COLSTON & BORROWFIELD HERDS OF LARGE WHITE PIGS, the property of R. Millington Knowles, Esq., The Hall, Colston Bassett, Notts.—Numbers and quality equal to pre-war standard.—Particulars from AGENT, Estate Office, Colston Bassett, Notts.

DENNY, E. H. M., STAPLEFIELD PLACE, STAPLEFIELD, SUSSEX.—Large White Yorkshire Pedigree Pigs. Station: Haywards Heath. Telegrams: Handcross.

GREENALL, SIR GILBERT, BART., C.V.O., WALTON HALL, WARRINGTON. The Walton and Worsley Herd of Pedigree Large White Pigs. Selections of all ages for sale at moderate prices. Apply to the Manager, The Office, Bridge House, Higher-Walton, Warrington. Station: Warrington. Trains met by appointment.

THE WARREN HERD OF PEDIGREE LARGE WHITE PIGS, the property of H. T. Williams, Esq.—Young Stock of the best strains for Sale, including a fine selection of in-pig Gilts.—Apply to **RAYMOND KEER, Warren Home Farm, Broughton, Chester.**

MIDDLE WHITE.

CHIVERS, JOHN, HISTON, CAMBRIDGE.—Select Herd of Pedigree Middle Whites. Champion Cup for Best Middle White Pig at Royal Show, 1919 and 1920 (won outright). Champion Boar, 1st and reserve Champion Sow, Royal Show, Derby, 1921. Young Stock always for sale.

EDGE, S. F., GALLOPS HOMESTEAD, DITCHLING, SUSSEX.—Albany Herd of Pedigree Middle Whites. Bred on open air system. Wonderful doers and breeders. Will thrive anywhere.

THE
YORKSHIRE
INSURANCE COMPANY Limited.

FARMERS' INTERESTS SPECIALLY STUDIED.
*Have you increased your FIRE INSURANCE
on New Crops to meet present day values?
If not, consult the "Yorkshire."*

Chief Offices:

York: ST. HELEN'S SQUARE.

London: BANK BUILDINGS, PRINCES ST., E.C.2.

Branches and Agencies throughout the Kingdom.

FARMING

LEARN BY POST

TO make farming pay really well. We have trained hundreds to succeed. Why not you?

WE have courses of instruction in every branch of Mixed, Stock, Arable and Dairy Farming, Veterinary Science, Farm Accounts, &c.

ALSO a special course in Land Agency for those going in for the management of landed estates.

THE College has been established 18 years. Send postcard for a free prospectus to The Agricultural Correspondence College (Sec. N), Ripon.

FARMING

LIME

FOR AGRICULTURAL PURPOSES.

The Purest Lime on the Market.

Made from the famous **CALLOW ROCK LIMESTONE** in **GAS - FIRED KILNS.**

Lump and Ground Lime and Hydrate of Lime.

Order a trial lot and judge the quality for yourself.

THE CALLOW ROCK LIME CO., LTD.,

810/11, Salisbury House, E.C.2.

Telegrams—Engicont, London.

Telephone—London Wall 140.

U.M.I. PIG FENCING

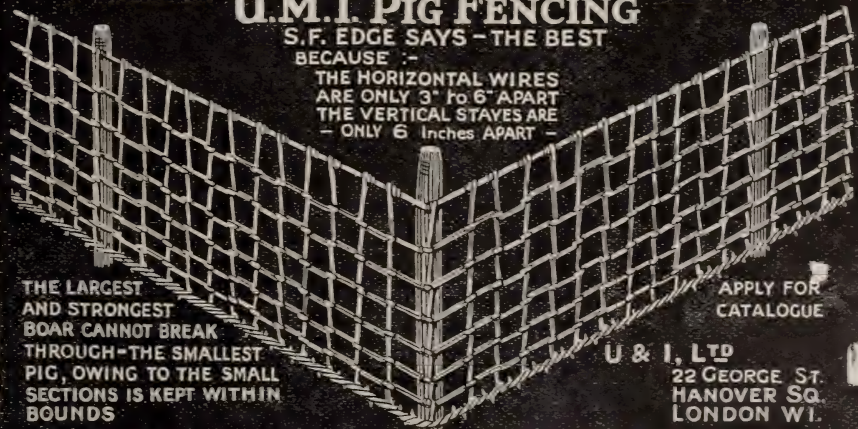
**S.F. EDGE SAYS - THE BEST
BECAUSE :-**

**THE HORIZONTAL WIRES
ARE ONLY 3" TO 6" APART
THE VERTICAL STAYES ARE
- ONLY 6 Inches APART -**

**THE LARGEST
AND STRONGEST
BOAR CANNOT BREAK
THROUGH - THE SMALLEST
PIG, OWING TO THE SMALL
SECTIONS IS KEPT WITHIN
BOUNDS**

**APPLY FOR
CATALOGUE**

**U & I, LTD
22 GEORGE ST.
HANOVER SQ.
LONDON W1.**



PIGS—continued.

MIDDLE WHITE—continued.

STAPLEFORD HERD OF MIDDLE WHITE PIGS. A few choice gilts and boars Sired by Royal Winners always for sale at reasonable prices. C. S. HARVEY, Wymondham, Oakham.

SKIPWITH, Captain C., LOVERSAL HALL, DONCASTER.—Loversal herd of Pedigree Middle Whites. Bred on open air system. Moderate Prices.

LARGE BLACK.

PICKWELL HERD, Pedigree Large Blacks. Young stock from best strains at reasonable prices.—CAPTAIN CLAUDE W. HEMP, Stainbridge Farm, Bolney, Sussex.

NEWHOUSE HERD OF Pedigree Large Black Pigs. Boars and Gilts from best strains.—ROBERT FORTUNE, Newhouse, Oranleigh, Surrey.

DUNSTALL HERD of Pedigree Large Blacks, bred from prize strains under natural conditions. Prolific, hardy, grand doers and of choice type. Young Boars and Gilts. Prices Moderate.—LIONEL E. HORNE, Moreton-in-Marsh, Glos.

EDGE, S. F., GALLOPS HOMESTEAD, DITCHLING, SUSSEX.—Pedigree Large Blacks, marvellous open air strain.

GLOUCESTER OLD SPOT.

THE FAIRFIELD HERD OF GLOUCESTER OLD SPOT PIGS for Sale. 100 to choose from, including winners at Hereford and Worcester Show. Gilts, Boars and Sows with litters; also, owing to change of blood, several Boars by Berkeley Foreman.—J. B. DOWDING, Fairfield, Leominster

POULTRY.

BOOTHROYD, F.—Breeder and Exhibitor of Pedigree Utility Rhode Island Reds S.C. White Wyandottes, Light Sussex, Black Leghorn. Eggs, Day old Chicks, Stock Birds. Catalogue Free. F. BOOTHROYD, Shustoke, Nr. Coleshill, Warwickshire.

MAJOR, ARTHUR C.—Breeder and Exhibitor thirty years. Champion Duck and Silver Grey Dorkings, "England's best fowl." Prizes at all Shows, and exported all over the world. Prices moderate. Eggs, 1s. each.—ARTHUR C. MAJOR, Ditton, Langley, Bucks.

White Leghorns, White Wyandottes, Light Sussex. Stock bred from Laying Competition Winners. Eggs, Day-old Chicks and Stock birds for sale. Illustrated List free—JOHN CHIVERS, Estate Office, Histon, Cambridge.

MISCELLANEOUS ADVERTISEMENTS—(Cheap Prepaid).

64 Page Book about Herbs and How to Use Them, 2d.—TRIMNELL, THE HERBALIST, RICHMOND ROAD, CARDIFF.

Westmorland Grown Seed Potatoes. Kerr's Pink, Arran Comrade, Arran Victory. Ministry of Agriculture Certificate.—GEORGE COLLIN, Chiburn, Penrith.

The Rural Information Weekly Service (issues August 27th to Oct. 8th) contains the REPRINTS FROM HANSARD re NAUTIC PHOSPHATES, and also affords considerable enlightenment to farmers upon other agricultural topics. Complete set price 1s. 9d. post free.—LANCASTER SMITH, Sidmouth.

All applications for Advertisements in "The Journal of the Ministry of Agriculture" should be addressed to C. VERNON & SONS, LTD., 38, Holborn Viaduct, London, E.C. 1.

**EGGS
INSURED**
in the "POCOCK"
PATENT and
"CUSHION" PATENT

Egg Boxes

insurance Policy
with every Box.

Catalogue Free.

DAIRY OUTFIT Co., Ltd.,
King's Cross, London.



**The "TOPPING" (REGD.)
Steel Bottle Can**



Strong as a Rail Churn.
Spillproof. Dustproof.
Seamless Top and Cover.

Sizes—4 to 10 GALLONS.
CHEAP AND DURABLE.

Write for List.

Makers:
Dairy Outfit Co., Ltd.,
King's Cross, London (1).

The Standard Cyclopedia OF Modern Agriculture

SOME SUBJECTS IN VOLUME ONE

—AND—

SOME OF THE CONTRIBUTORS

Aberdeen-Angus Cattle. By James Cameron, Agricultural Editor, *Glasgow Herald*.
Abscess in Animals. By Harold Leeney, M.R.C.V.S.
Farm Accounts. By John O. Peet, B.Sc.
Aftermath. By Primrose McConnell, B.Sc., F.G.S.
Land Agent. By Richard Henderson (the Duke of Portland's Estate Agent).
Age of Animals. By Harold Leeney, M.R.C.V.S.
Age of Plants. By Prof. A. N. M'Alpine, B.Sc., A.R.C.S.
Agricultural Holdings Act. By A. J. Spencer, M.A., Barrister-at-Law.
History of Agriculture. By W. E. Bear, former Editor of *Mark Lane Express*.
Albumens. By Prof. R. A. Berry, F.I.C., F.C.S.
Alkali Soils. By E. J. Russell, D.Sc.
Alluvial Soils. By Prof. G. A. J. Cole, F.G.S., and Prof. R. P. Wright.
Stiff Joint. By Harold Leeney, M.R.C.V.S.
Ancona and Andalusian Fowls. By E. Brower, F.L.S.
Animal Chemistry. By Prof. R. A. Berry, F.I.C., F.C.S.
Diseases of Animals. By Harold Leeney, M.R.C.V.S.
Laws regarding Animals. By David Bruce, M.A., LL.B.
Apples. By W. Watson, A.L.S. (Curator of Kew), and W. G. Smith, B.Sc.
Arab Horses. By W. Scawen Blunt.
Arboriculture. By John Nesbit, D.Sc.
Artificial Manures. By J. Hendrick, B.Sc., F.I.C., F.C.S.
Atavism. By Prof. Cossar Ewart, M.D., F.R.S.

PRESS OPINIONS.

FARMER AND STOCKBREEDER says: "This encyclopaedia has had a favourable reception from farmers. Every succeeding volume confirms the earlier impressions of the thoroughness with which the ground is covered."

The Field says: "The work forms not only the largest and the most comprehensive but the most complete Cyclopedia of Agriculture. The writers upon the different subjects are well chosen, and as each contribution bears the initials of the author, the reader is in a position to form his estimate of the value of the article. The book is handsomely brought out and suitably illustrated."

The re-issue of this well-known Book

is an event of great importance to the farming world, as the work has become the recognised standard authority for the progressive farmer. It would be quite impossible for us to give an adequate idea of the contents of this work in the space at our disposal for everything connected with Agriculture is dealt with. Not only so, but the articles are written by the most competent and distinguished experts in the United Kingdom, America, the Colonies, and the Continent. There are contributions by more than

200 EXPERTS

under the editorship of that well-known and distinguished authority.

PROFESSOR SIR ROBERT P. WRIGHT, F.H.A.S., F.R.S.E.,

Chairman of the Board of Agriculture for Scotland; formerly Principal of the West of Scotland Agricultural College, Glasgow.

We have space for only a few names of contributors, but these will give good evidence of their high standing.

OUR OFFER TO YOU

If you are interested in this book, we are prepared to give you an opportunity of examining it without any risk of expense or loss. We are agreeable to send the complete book carriage paid for seven days inspection, and if necessary, will pay the return carriage. To accept this offer would not involve you in any responsibility to purchase the book if you found it unsuitable. Our only purpose is to enable you to DECIDE FOR YOURSELF whether it is a satisfactory investment.

THE WORK WILL PAY FOR ITSELF — OVER AND OVER AGAIN —

Send this coupon in an open envelope—postage 1d., or a post card will do.

To the **Gresham Publishing Co., Ltd.**,
66, Chandos Street,
Strand, London, W.C.2.

Please send me carriage paid, a complete set of the "STANDARD CYCLOPEDIA OF MODERN AGRICULTURE," in 12 volumes on the understanding that I may either return same after seven days. Carriage Forward, or purchase the work by forwarding 12/6 and agreeing to send 12/6 per month until the total sum of £7 10s. has been paid.

Name.....
Full address

“National Utility Poultry Society,” 3, Vincent Square, Westminster, S.W.1.

President: The RT. HON. LORD CLAUD HAMILTON.

Chairman: S. STREET-PORTER.

Vice-Chairman: MARCUS SLADE.

Secretary: MRS. RAWSON.

Hon. Treasurer: THOS. SAVAGE.

Hon. Organising Secretary: T. R. ROBINSON, F.S.I.

The Society exists for the promotion of the Industry and protection of the interests of the Poultry-Keeper.

The Society has special Committees to deal with the various aspects of the Industry.

The Society has many branches and facilitates the interchange of speakers at different meetings.

Members and staff of the Society advise by either correspondence or personal interview.

The Society was the organiser of Laying Tests.

For Prospectus, Year Book and publications apply to the Secretary at the above address.

Normal Subscription, 10s.; Small Owners, 5s.; Fellowships 1 guinea and 2 guineas, to include weekly “Journal,” etc.; Life Membership, 5 guineas.

“THE NATIONAL POULTRY JOURNAL” IS PUBLISHED WEEKLY.



Wood Preserving Stain has three

important properties :

It preserves wood indefinitely,

It stains it in rich, artistic colours,

It is antiseptic and disinfectant.

*Please write for colour sheet to 205, Boro' High Street,
London, S.E.1, mentioning Ministry of Agriculture.*

MAJOR AND COMPANY LIMITED.

HOW I MAKE BIG MONEY OUT OF UNMANAGEABLE HORSES.

By J. A. BUTLER.

ABOUT two years ago, when I was in America, I witnessed up in New York State an exhibition of horse-training that opened my eyes. A man by the name of Mackley took a devil of a mean, vicious mare that hadn't been harnessed for seven months, and in a few days had her gentle enough for a schoolgirl to drive. Mackley had taken the mare off the owner's hands for £10, and just ten days after sold her for £35. A clear profit of £25 in ten days!

That started me investigating. I learned that Mackley had simply used the methods introduced by the famous horse trainer, Jesse Beery. Beery, I learned, used to go about the country giving wonderful exhibitions in colt-breaking and horse-training; but realising that he could accomplish more by teaching his methods by post, had given up his exhibition work to spread his horse-training secrets by postal instruction. Mackley had studied Beery's Course in his spare time, and in a few months was able to accomplish magical results with unbroken colts and horses with bad habits.

OTHER SUCCESSES.

Mackley's work showed me a way to make some big money, and I determined to take Prof. Beery's Course in horse-training—but before doing so I made further inquiries. Here are what a few of Beery's students said. I'll let them tell of their success in their own words.

Mr. S. L. Arrant writes:—Just to test Beery's methods, I bought the worst balky, kicking, fighting horse I could find. Paid £13 for him. After handling him only a few hours according to Beery's system I sold him for £27.

Mr. Dell Nicholson, Portland, writes:—I have trained a four-year-old mare that was given up by everybody. Bought her for £7, and now have her so gentle, my little boy handles her. Wouldn't take £40 for her.

Dean L. Smith, Findley, writes:—By following Beery's instructions have changed a worthless, dangerous balker into a horse worth £45.

Everett McBlock writes:—Have just broken a pony to drive and taught it some tricks. Owner bought it for £3 10s. Paid me £8 to train it. He just sold it to a show company for £30.

HOW I WORK.

The big source of my income is in buying up unmanageable colts and horses at bargain prices, and, after training the animals, selling them at a

good profit. However, I also pick up good money handling colts and training horses for others on a fee basis. For instance, a farmer had a beautiful driving bay that had the bad habit of shying. A piece of paper blowing across the road would set the horse crazy. The owner thought a great deal of the animal, but couldn't take chances on the shying habit. A friend of his for whom I had done some work put this man in touch with me, and in a few hours I had the horse completely cured of the habit—for which job I received £10.

CURING BAD HABITS.

You can see from this that my work consists not only in breaking colts and "gentling" vicious horses, but in curing the various bad habits a horse can have—such as shying, balking, fear of motor cars, etc., pulling at hitching strap, pawing in the stall, etc., etc.—Beery's methods of colt breaking are particularly amazing. Under the old way of handling raw colts one usually had to half kill the horse as well as himself to accomplish anything—and then the colt was usually spoiled or hurt in some way or another. But when you apply Beery's principles there is no hard, long work or injury to the colt.

No one should have a biting, kicking, or balky horse when it is so easy to cure these vicious habits. No one should attempt to break in a colt the old-fashioned way when Beery's methods make the task so easy. To every horse-owner, to every lover of horseflesh, my advice is to get acquainted with the Beery principles. You can not only make money for yourself, but you can do a world of good, particularly at this day when war-demands have placed a premium on horses.

WONDERFUL BOOK FREE.

I have been requested to state that Prof. Jesse Beery will send his remarkable booklet, "How to Break and Train Horses," free to those interested. It is a booklet well worth having, as it reveals some startling information on horse-training. I have heard men who considered themselves expert horsemen say that the booklet was a revelation to them. There is no use in my going into details on the booklet when you can get it free for the asking.

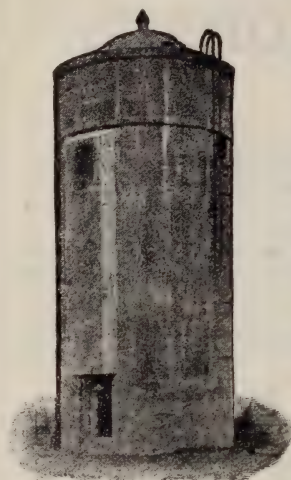
Just drop a line to Prof. Jesse Beery, Dept. 14212, Pleasant Hill, Ohio, U.S.A., and the booklet will be sent free by return of post. A postcard (1½d. stamp) will do as well as a letter.



Reinforced Concrete Silos

SAVE MONEY.

The Scott Reinforced Silos are better and cheaper than Timber.



YOU can feed your stock with Ensilage at half the cost of Roots and get double the results. This is proved by our friends whom in many cases have placed repeat orders.

No upkeep required with our Silos, your initial outlay is the last and you can pay off the expense in two years.

We are Silo specialists with experience behind us and we invite you to write to us for full particulars.

Scott Silos are found all over the British Isles.

JAMES SCOTT & SON,
(ABERDEEN) LIMITED,
483-485, Union St., Aberdeen.

VICKERS FERTILISERS

*The Way
to
Profitable Farming*

COMPOUND FERTILISERS

For All Crops.

SUPERPHOSPHATES.

STEAMED BONE MEAL.

SULPHATE OF AMMONIA.

BASIC SLAG.

SULPHATE OF COPPER.

THOMAS VICKERS & SONS, Ltd.

Telegrams: "Vickers, Widnes."
Telephone 115 (2 lines).

WIDNES, LANCs.

The Netting
you will have
eventually—

FAULTLESS

BECAUSE it lies dead flat without curves or bulges and gives no trouble.

It is made to stand heavy strains too, being of fine grade wire, galvanized after manufacture.

High quality and low price is another combination that makes "Faultless" the Netting you should test NOW.

Send us particulars of your requirements and we will gladly quote carriage paid prices for large or small quantities, direct from works.



David & Co.
TAFF VALE IRONWORKS
CARDIFF

HALL & CO., LTD.

'Phone: Purley 10.

Lime Burners,

COULSDON, L.B. & S.C. Rly.

GROUND CARBONATE OF LIME

(For Agricultural Purposes)

17/6 per Ton loaded in Bulk F.O.R. Coulsdon.

Orders should be booked at once to secure prompt delivery.

WHITE LUMP & GROUND LIME

For Agricultural Purposes.

All kinds of **CHALK** supplied from **Lump Chalk** for road making down to extremely

Fine Powdered Chalk for Pharmaceutical purposes.

Head Office:

Victoria Wharf, E. Croydon.

Telegrams: "CEMENT, CROYDON."

'Phone: 'CROYDON, 1104.'

A BOOK OF REAL IMPORTANCE
BOTANISTS, PLANT BREEDERS, MILLERS
AND AGRICULTURISTS.

THE WHEAT PLANT

A MONOGRAPH BY

JOHN PERCIVAL, M.A., F.L.S.

This is a scientific work of extreme importance. No other work is in existence in any language devoted exclusively and fully to WHEAT—the plant of all others most vital in all parts of the world. The monograph is the outcome of more than 20 years' practical study and experiment. Part I deals with the Botany of the plant and its various parts, and Part II with the methods of cultivation of the different varieties, with chapters also on Hybridisation, Breed and Yield. Prof. Percival is well-known as the author of "AGRICULTURAL BOTANY" (18/- net), now in its 6th Edition.

THE WHEAT PLANT.

Crown 4to, 476 Pages, 228 Illustrations, 63/- net.

DUCKWORTH & CO., 3, Henrietta St., London, W.C. 2.

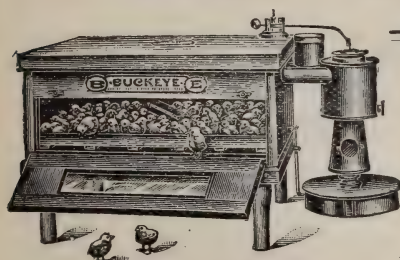


ILLUSTRATION OF No. 14.

Also made in Mammoth size
for 2,440 to 10,368 Eggs

OIL AND COAL BURNING BROODERS
from £4 18 0 to £9 15 0.

If necessary, any spare parts can
be supplied from stock.

Sole Selling Agents for the United
Kingdom and Colonies for

**"BUCKEYE" INCUBATORS
& BROODERS**

W. B. FORDHAM & SONS., Ltd.

(Dept. A.), 36-40, York Rd., King's Cross,

LONDON, N. 1.

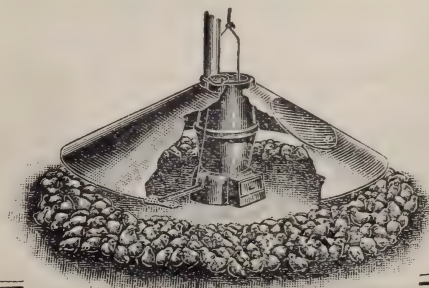
FULLY ILLUSTRATED PRICE LIST UPON APPLICATION.

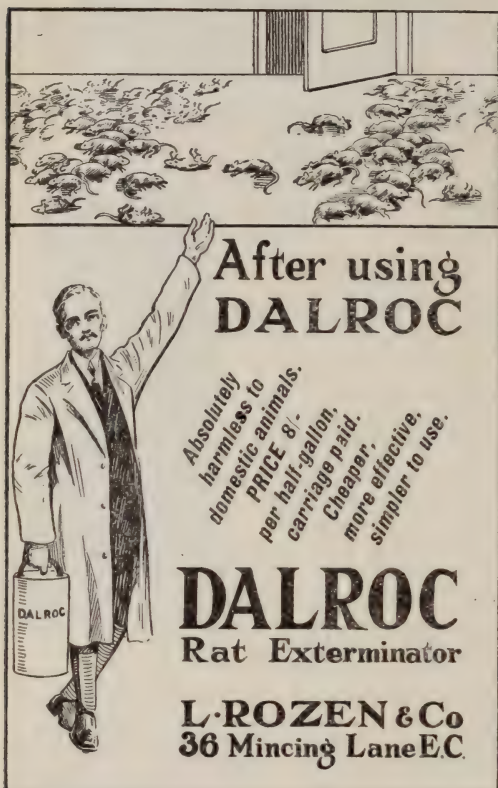
"BUCKEYE" The World's best Incubator.

Guaranteed to hatch more and stronger chickens than any other incubator; to operate satisfactorily in any temperature down to freezing; to require no artificial moisture, and no attention to the regulator from the time the hatch is started until it is finished.

Style E, No. 14—for	65 Eggs	£7 10 0
" No. 16	120 "	13 0 0
" No. 17	210 "	18 6 0
Standard, No. 1	120 "	18 12 6
" No. 2	175 "	19 6 0
" No. 3	250 "	24 0 0
" No. 4	350 "	30 0 0
" No. 5	600 "	46 15 0

All prices quoted are carriage forward.





**After using
DALROC**

Absolutely
harmless to
domestic animals.
PRICE 8/-
per half-gallon,
carriage paid.
Cheaper,
more effective,
simpler to use.

DALROC
Rat Exterminator

L. ROZEN & Co
36 Mincing Lane E.C.

PROFITABLE FEEDING!!

OUR STEAM-COOKED FOODS

FOR

PIGS and POULTRY

are prepared from

THE BEST INGREDIENTS ONLY

PERFECTLY STERILISED
AND WELL BALANCED.

PIGMEAL

MEAT MEAL

MEAT and BONE

Specially Prepared **GREEN BONE** *In Three Grades*
ADULT "CHICK," MEAL.

Samples Analysis and Prices on
Application to the Makers

NATIONAL BY-PRODUCTS LTD.

Goschen Buildings,
Henrietta Street, Strand, London,
W.C.2.



Farmers' Handy Balance.

To weigh 28 lbs.

Tinned Steel Pan 22 in. x 15 in. very strong,
suitable for general use.

45/-

Cash with Order.

Carriage paid nearest railway station.

Herbert & Sons, Ltd.

Weighing Machine Manufacturers,
7, WEST SMITHFIELD,
LONDON, E.C.

THE ONLY GENUINE EGG PRODUCER.

Rudd's Meat & Bone Meal

20/- per cwt. on rail. Carriage paid within
50 miles of London, 2/6 extra. A handful of
this Meal to every dozen hens in the soft food
each morning will give astonishing results.

TRY IT on our recommendation.

Rudd's Pure Fish Meal

20/- cwt. on rail. Delivered, 2/6 extra, same as
above.

Rudd's Laying Meal

Containing Fish, Meat and Bone, and Biscuit,
20/- on rail. Delivered, 2/6 extra, same as above.

Write for our List of

Poultry Foods

all the very best grain at remarkably low prices.

Only Address—

W. A. RUDD & CO., LTD.,
WHOLESALE CORN MERCHANTS,
180, Bishopsgate, London, E.C.2.

Insect Pests and Fungus Diseases
prevent Successful Farming.

Napthalim

Sown broadcast at 4 cwt. per acre and
ploughed in

Kills Wireworm, &c.

Eradicates "Club."

Crops grown on land dressed with *Napthalim*
are abundant in quantity and improved in
quality. The cost of dressing is saved many
times over.

Price $\frac{1}{2}$ ton lot, £7.

1 ton, £13.

2 tons, £25 10s.

RENE D RAY & CO.,

3, OLD MILLS, HOUNSLOW.

K.C.C. Organic Nitrogenous Meal

A purely animal product containing
approximately 8·30% Ammonia of which
85% is soluble. The most efficient Fertilizer
for wheat and all cereals, supplies humus to
the soil and stimulates growth.

Prices and samples to be had on application.

The Kent Chemical Co., Ltd.,
7, King Street, West Smithfield, E.C.1.

All applications for Advertisements in

"The Journal of the Ministry of Agriculture"

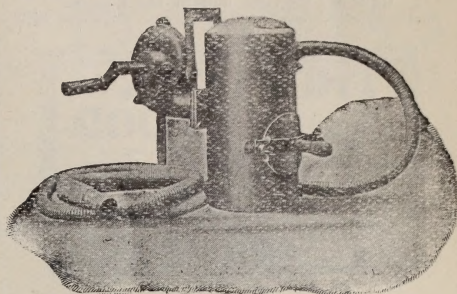
should be addressed to

C. VERNON & SONS,

38, Holborn Viaduct,

London, E.C.

THE "CLAYTON"



GASSING MACHINE

for DESTRUCTION OF RATS, RABBITS, &c.
producing sulphurous gas of high
strength without danger to operator
or domestic Animals.

Unlike Poisons, Virus and Trapping, it
Destroys not only Adult Vermin, but
also the Young in the Nests.

Used by PUBLIC BODIES, ESTATE
OWNERS, FARMERS, &c.

Full Particulars from—

CLAYTON FIRE EXTINGUISHING & DISINFECTING CO. LTD.,
22, Craven Street, Strand, London, W.C.2.

Agents { RESSICH & CAMPBELL, 118, Queen St., Glasgow.
W. O. DAY, Church House, Lord Street, Liverpool.

'DAK' RATLIME

FOR RAT EXTERMINATION
Supersedes Dangerous Poisons

Holds its victims on the spot so
that they cannot get away to die
under floors, etc.

*Write for interesting leaflet giving
details of the 'DAK' method and
reports by users to Dept. J.*

KAY BROTHERS Limited
Manufacturing Chemists. STOCKPORT

ANDREW WEIR & CO.,

Sack and Bag Manufacturers
and Merchants,

21, PARLIAMENT ST., LIVERPOOL.

Telegrams: "Weirsac."

'Phone: 895 Royal.

Lancashire, Cheshire, Shropshire & North Wales.

Messrs. BOULT, SON & MAPLES,
VALUERS, SURVEYORS, ESTATE AGENTS, AND
PROPERTY AUCTIONEERS.

Offices: 5, COOK STREET, LIVERPOOL.

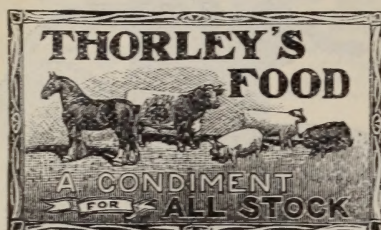
Telegrams—"Aeres," Liverpool.

Telephones—187 Bank—2 lines.

Estates, Farms, Residential and Business Properties only.
Periodical Sales of Property at Liverpool, Chester and Preston.

STRONG, HEALTHY STOCK

Growing, thriving, and in the pink of condition secured by feeding on food seasoned with



THORLEY'S FOOD FOR CATTLE

Creates Appetite. Aids Digestion.

The actual province claimed for Thorley's Food for Cattle is that it enables animals to extract the whole nutritive properties of the bulkier food consumed with the least possible strain on the digestive system—hence its value for

HORSES, CATTLE, SHEEP & PIGS.

Try Thorley's Food

Sold by Agents Everywhere.

112 lb. Bag, 48s. Case containing 448 Packets, 55s.

For Cash with Order from

JOSEPH THORLEY, Ltd.,

100 All Saints' St., Kings X, London, N.1.

WORMS IN HORSES



can be
entirely
eradicated
by using

VITUM

Thorley's
Concentrated
Condition Powder
for Horses,

which not only expels worms from Horses,
but prevents their attacks.

**VITUM contains no poisonous
ingredient whatever.**

Sold by Agents in all parts in 7 lb. and 1 lb. Tins.

If agent is out of stock, sent direct for cash with
order, 7 lb. Tin, 10s. 1 lb. Tin, 2s.

Joseph Thorley, Ltd. 100 All Saints' St.,
King's Cross, N.1.

Proprietors of Thorley's Food for Cattle.

“CLARENDON”

COOKED FOODS.

Eminently suitable for Horses, Cows, Sheep, Goats, Pigs, Dogs and Deer.

“COMUS” COOKED MEAL.

Par excellence for Dairy and Pig feeding. Always ready.

POULTRY FOODS.

Cooked Foods, Meals, and Grain Mixtures for all ages.

“CE-DO” MEAL.

Uncomparable for Egg production and Chicken-rearing.

We challenge comparison both as to price and quality.

Free Samples and particulars on application.

Sole Makers:

White, Tomkins and Courage, Limited

Head Office 48, Mark Lane, E.C.3.

Also at Liverpool, Belfast, Boston, Tandragee and Templemoyle.

ESTABLISHED 1841.

EPHOS BASIC PHOSPHATE

*A radio-active phosphatic fertiliser,
containing 60-65% Phosphates.*

HIGHLY SOLUBLE.



For grain and roots "EPHOS" will give results comparable to superphosphate and basic slag, while it excels both in the promotion of leaf and stem.

"EPHOS" counteracts soil acidity.

"EPHOS" is particularly well adapted for mixing in compound manures.

CROOKSTON BROS.,

38, Grosvenor Gardens, London, S.W.1.

Telegrams—"Croobros,
Sowest, London."

Seed Testing at Raynes Park



Agricultural Grasses under Test in the Laboratory.

REALISING the advantages to the agricultural community and to ourselves in selling tested and pure seeds, we have always devoted the greatest care to the cleaning and testing of farm or garden seeds, and with sufficient faith in our seed-cleaning methods to promote the Bill in Parliament for passing the Seed Adulteration Act of 1869. The beneficial results of this Act were almost immediate, and the late Mr. James Carter was able to see before his decease the effects of the practice he inaugurated of guaranteeing the full germination and absolute cleanliness of all seeds sold by our House. We are still carrying out the work he commenced of improving the national stocks of seeds, and the application of scientific methods and improved machinery have enabled us to reach now a standard of purity and germination of seeds that has never before been attained.

The founder of our firm James Carter, was, we believe, the first to guarantee the germination of his seeds eighty-four years ago.

All our seeds, after passing through our Laboratory Tests, are grown in our grounds at the same time as our customers grow them, to full maturity, so that we may assure ourselves of the quality and trueness of each variety. By examining our trials from time to time we know exactly how the produce of our seeds should appear in the gardens or on the farms of our customers all over the world.

Carters Grass and Clover Seeds

For Temporary and Permanent Pastures

Specially prescribed to suit all soils.

Illustrated Catalogue of Farm Seeds. Post Free.

Carters
TESTED SEEDS

SEEDMEN TO H.M. THE KING.

RAYNES PARK, LONDON, S.W.

Telegrams—"Carters, London."

Telephones—1100, 1101, 1102, P.O. Wimbledon; 332 Holborn.

